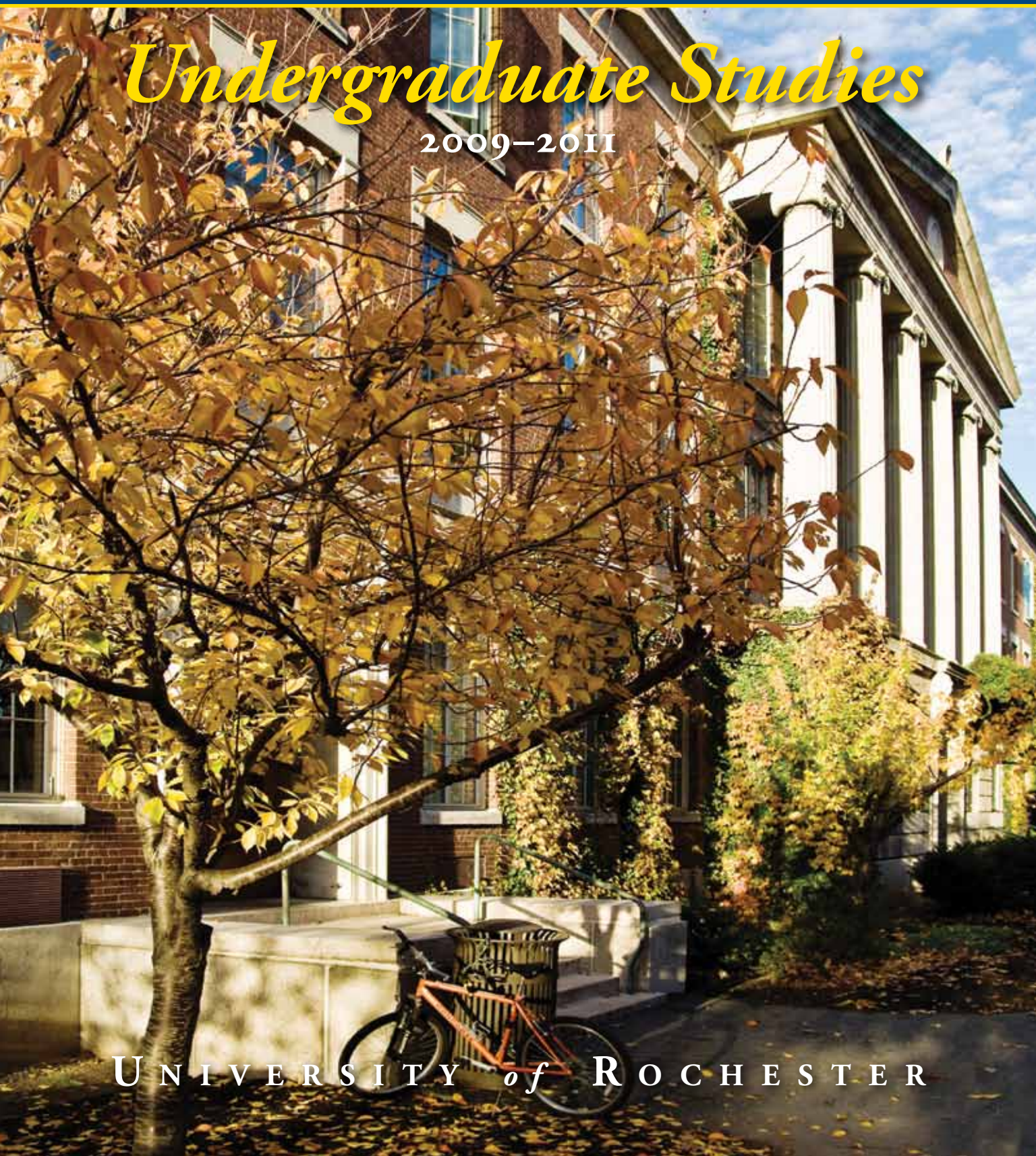
Official Bulletin

Undergraduate Studies

2009–2011



University *of* Rochester

The University of Rochester values diversity and is committed to equal opportunity for all persons regardless of age, color, disability, ethnicity, marital status, national origin, race, religion, sex, sexual orientation, veteran status, or any other status protected by law. Further, the University complies with all applicable nondiscrimination laws in the administration of its policies, programs, and activities. Questions on compliance should be directed to the particular school or department and/or to the University's Equal Opportunity Coordinator, University of Rochester, P.O. Box 270039, Rochester, New York 14627-0039. Phone: (585) 275-9125.

The information in this bulletin was prepared in the spring of 2009. Provisions of this publication are not to be regarded as an irrevocable contract between the student and the University. The University reserves the right to make changes in its course offerings, degree requirements, regulations and procedures, and fees and expenses as educational and financial considerations require.

Current information is available from the Office of the Registrar, P.O. Box 270038, University of Rochester, Rochester, New York 14627-0038. Phone: (585) 275-5131.

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THE COLLEGE
School of Arts and Sciences
Edmund A. Hajim School of Engineering and Applied Sciences
EASTMAN SCHOOL OF MUSIC
SCHOOL OF MEDICINE AND DENTISTRY
SCHOOL OF NURSING
WILLIAM E. SIMON GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
MARGARET WARNER GRADUATE SCHOOL OF EDUCATION
AND HUMAN DEVELOPMENT

OFFICIAL BULLETIN
UNDERGRADUATE STUDIES
2009–2011

(Separate bulletins also are published for
graduate studies and by the Eastman School of Music,
School of Medicine and Dentistry, William E. Simon
Graduate School of Business Administration, and
Margaret Warner Graduate School of Education and Human Development.)

Contents

Some notes about

The University

The University of Rochester, founded in 1850, is one of the most innovative of the leading private research universities in the country—and for undergraduates, it's a university in perfect balance.

Rochester offers the choices and intellectual excitement of a large research university with the intimacy and opportunities for personal involvement of a small liberal arts college.

More than 95 percent of classes are taught by faculty, not teaching assistants, and it's not uncommon for senior faculty to teach introductory courses—there's no separation between researching and teaching, between faculty's own professional excellence and the excellence they bring to the classroom.

Rochester students live on a lively, self-contained campus, just minutes from metropolitan Rochester—a dynamic city that offers a mix of commerce, culture, and history.

Rochester balances its innovative spirit and responsiveness to individual needs with a commitment to the lasting values of a classic liberal arts education.

The results of the Rochester experience are self-evident in the track record of its alumni—in their careers and in their personal lives. "To put it simply," says one student, "Rochester opens doors."

For many undergraduates, the Rochester experience means surrounding a chosen major with clusters of related courses that contribute to a broad liberal education. Others choose double majors or earn certificates in complementary fields. Still others individually design their own departmental programs.

And Rochester students can also benefit from the offerings of other schools and departments. For example, undergraduates can enroll in graduate courses; premed students can enroll in classes at the medical school or at the Eastman School of Music; future engineers can diversify their studies with an advanced course in Chaucer.

Rochester's opportunities are outlined in the remainder of this book. They include:

The Rochester Curriculum. Students have the freedom to define their own academic paths, driven by interest and curiosity. At Rochester, we believe that excellence requires freedom.

The "Take Five" Scholars Program. Cited as one of the more innovative liberal arts programs in the country, undergraduates may apply for a fifth year of courses tuition free.

The Senior Scholars Program. Selected undergraduates devote at least half of their entire senior year to a creative project, whether in the form of scholarly research, a scientific experiment, or a literary or artistic endeavor.

The Fifth Year in Teaching Program. A limited number of undergraduates pursue a fifth year of study tuition free in a master's program at the Margaret Warner Graduate School of Education and Human Development to prepare as urban school teachers.

The Guaranteed Rochester Accelerated Degree in Education (GRADE). A five-year B.A./B.S + M.S. education program assures students admitted to the University of Rochester who are interested in becoming educators admission to the Margaret Warner Graduate School of Education and Human Development.

The Robert Noyce Scholarships. A new scholarship opportunity for science, technology, engineering, and mathematics (STEM) majors to become effective science and mathematics teachers and to expand the number of highly qualified teachers serving high-need school districts. The Robert Noyce Scholarship program offers full tuition to up to 10 students per year (through 2010) who have a degree in math or science.

The Kauffman Entrepreneurial Year Program (KEY). Selected undergraduates devote a tuition-free fifth year to the study or practice of entrepreneurship.

The Rochester Early Medical Scholars (REMS) Program. Selected Rochester freshmen receive a conditional acceptance to the University of Rochester's School of Medicine and Dentistry when they finish the bachelor's degree. The program frees these students to develop their intellects broadly before they launch into their medical studies.

The Graduate Engineering at Rochester (GEAR) Program. A select number of freshman applicants are given an assurance of admission into one of seven engineering and computer science master's degree programs at the University of Rochester.

The Bachelor of Arts Degree in Engineering. Recognizing the need for broadly educated decision makers who are well versed in engineering, this program gives a student substantial technological knowledge and competence in at least two areas of engineering while also providing the opportunity for a liberal arts education.

The CareerSoURce. A nationwide alliance of more than 1,600 alumni volunteers, parents, and friends advise students on career planning, graduate schools, and internships.

There are approximately 4,800 full-time undergraduates including 500 or so at the Eastman School and 2,900 full-time graduate students at the University. The great majority of classes are small in size, enabling all students to work closely with their teachers. There is a single faculty for all students; some of the most distinguished senior professors teach beginning courses. Reflecting the personal scale of Rochester's programs, undergraduates are encouraged to work where possible with individual faculty members in the pursuit of original scholarship.

College students must make two major transitions in their first two years. In their first year, they make the important leap from high school to college. As sophomores, they make the crucial choice of a major. The College's Dean of Freshmen and Dean of Sophomores take special responsibility for those two important years in students' careers at the University.

An administrative staff also offers support, starting with an orientation program on campus before the beginning of freshman year. Staff are also available to supply advice on course and major requirements; to help students find paying internships and employment opportunities; and to assist in the development of post-college plans.

Students can't expect to gain a "Rochester education" simply by studying and attending class. Out-of-class activities—whether they're intramural sports, political clubs, community service, or movies and concerts—are a major part of undergraduate life.

THE COLLEGE

The great majority of undergraduates enroll in the College, which comprises departments and programs in the School of Arts and Sciences and the Edmund A. Hajim School of Engineering and Applied Sciences. Therefore, transferring between degree programs does not require any formal "readmission" process. The College's faculty and staff play an active role in academic advising (page 172).

The College (pages 14 to 133) is the oldest of the University's seven academic units. The College's programs in the **School of Arts and Sciences** provide undergraduate and graduate degree programs in the humanities, natural sciences, and social sciences. The College remains the "home" college for most undergraduates during their studies at Rochester.

The Edmund A. Hajim School of Engineering and Applied Sciences (pages 134 to 159) enrolls first-year students who express an interest in concentrating in one of the engineering disciplines. Students may also move into an engineering program at any time after their first semester provided they have the appropriate science and mathematics background and have, or can schedule, the necessary prerequisites for their intended major. The School's Bachelor of Science programs in biomedical, chemical, electrical and computer, and mechanical engineering are accredited by the Accreditation Board for Engineering and Technology, the national accrediting agency of the engineering profession. The Institute of Optics, which also offers a Bachelor of Science degree, is an internationally known center for teaching and research. In addition, there are provisions for student-designed programs that can lead to either a Bachelor of Science in interdisciplinary engineering or a Bachelor of Arts in engineering sciences as well as Bachelor of Arts and Bachelor of Science degrees in computer science.

OTHER SCHOOLS OF THE UNIVERSITY

The Eastman School of Music (page 160), known throughout the world as a major center for the education of professional musicians as well as for the study and creation of music, offers diverse curricula leading to undergraduate and graduate degrees. Students pursuing a Bachelor of Arts degree with a major in music through the College take some of their coursework at the Eastman School. Other University undergraduates, having met the requirements and with permission, may also take applied music lessons or other music courses

at Eastman. Some students apply and are admitted both to the College and the Eastman School, and pursue a dual degree program.

In addition to the programs leading to the M.D., M.S., M.P.H., and Ph.D. degrees, the **School of Medicine and Dentistry** offers unusual opportunities for undergraduates. In the Rochester Early Medical Scholars Program (REMS), exceptionally talented students enter the University with a conditional acceptance to the medical school.

The School of Nursing (pages 161 to 164) offers study leading to the Bachelor of Science degree with a major in nursing. Admission to the School of Nursing requires *either* a registered nurse license *or* a prior baccalaureate degree in a non-nursing field. The curriculum is designed to be responsive to adult learners, and this has become the focus of the baccalaureate nursing program. The degree programs offered by the School include a Bachelor of Science, an R.N. to B.S. or R.N. to B.S. to M.S. program for registered nurses, Master of Science nurse practitioner specialties, M.S. in leadership in heath care systems, M.S. and Ph.D. dual-degree programs, Doctor of Nursing Practice, and the Doctor of Philosophy in Health Practice Research.
Post-master's programs are also available.

The William E. Simon Graduate School of Business Administration (pages 165 to 168) offers graduate study in business administration for management careers in the profit and nonprofit sectors. For undergraduates interested in such careers, it also offers a unique opportunity to earn an undergraduate degree and a Master of Business Administration degree (M.B.A.) in five years instead of the usual six. This 3-2 program consists of three years of undergraduate study in another college followed by two years in the Simon School. The School also offers undergraduate courses in management in the areas of accounting, behavioral science in industry, computers and information systems, finance, general business administration, law, marketing, and operations management.

The Margaret Warner Graduate School of Education and Human Development (pages 169 to 171) provides a broad range of courses of general interest to educators and those interested in the many issues related to education, socialization, learning, aging, leadership, and growth. The Warner School offers master's and doctoral degree programs in teaching and curriculum, school leadership, higher education, educational policy, counseling, and human development. Undergraduates can take courses in subjects ranging from the history of American education to child development and learning. In most cases, initial and professional teacher certification is obtained through 15 months of postgraduate study and is offered at the early childhood and elementary levels, in mathematics, English, Latin, French, Spanish, German, biology, chemistry, physics, earth science, and social studies at the secondary level, in Teaching English to Students of Other Languages in grades K–12, and a master's degree in Reading and Literacies at either the childhood or secondary levels. The Warner School offers the Guaranteed Rochester Accelerated Degree in Education (GRADE) program, which is a five-year B.A./B.S + M.S. education program for students admitted to the University of Rochester who are interested in becoming educators. GRADE students enter the University of Rochester with an assurance of admission to the Warner School with the Steven Harrison quarter-tuition scholarship for the duration of the program (this offer is contingent on students meeting prerequisites for their selected area of specialization by the time they complete their undergraduate program). The program is designed to offer students a quality liberal arts education while also preparing them to become educators. The Warner School also offers combined undergraduate and graduate programs in counseling and human development, designed for qualified University of Rochester undergraduate students planning either to become school counselors or mental health counselors, or to continue with graduate study in human development. Students begin graduate study toward the Master of Science (M.S.) degree during their senior year. The master's program in human development can be completed after one year of postgraduate study. The school counseling program, which leads to New York State certification as a school counselor, takes about two years of postgraduate study. The program in community mental health counseling that leads to New York State licensure in mental health counseling also can be completed in about two additional years.

UNIVERSITY CAMPUSES

The 79-year-old **River Campus** is the University's main campus and the residential setting for College undergraduates. It is also the location of the Margaret Warner Graduate School of Education and Human Development and the William E. Simon Graduate School of Business Administration. On the southern edge of the city, the 114-acre campus is tucked in a bend of the Genesee River. Next door are the University Medical Center and one of Rochester's many parks.

The Medical Center, adjacent to the River Campus and the site of the School of Medicine and Dentistry and the School of Nursing, has extensive facilities providing an excellent spectrum of patient care and research to support the educational programs. Strong Memorial Hospital (including Golisano Children's Hospital), with a capacity of 750 beds, is an integral part of the University's Medical Center and serves as the principal teaching hospital of the School of Medicine and Dentistry and the School of Nursing. The Medical Center also includes the Eastman Dental Center, the Wilmot Cancer Center, and the Kornberg Medical Research Building.

The Eastman School of Music is linked to the other campuses by free shuttle buses. Its Sibley Music Library, with resources numbering more than a half-million items, is recognized as one of the foremost music research libraries in the world. Housed since 1989 in the Miller Center, its collection includes autograph scores of masters of the past as well as those of many contemporary compos-

ers. Kilbourn Hall, Howard Hanson Recital Hall, Kilian and Caroline Schmitt Organ Recital Hall, and Eastman Theatre, one of the great theaters of the Western world, comprise the unparalleled performance facilities of the School. In addition, Eastman partners with Christ Church and the Memorial Art Gallery to provide performance venues involving new and restored organs.

The University's South Campus, a quarter-mile south of the Medical Center, is the site of the Laboratory for Laser Energetics and the Center for Optoelectronics and Imaging, which houses the Center for Optics Manu-facturing (COM), the Center for Electronic Imaging Systems (CEIS), and the Robert L. Sproull Center for Ultra High Intensity Laser Research. The Alumni and Advancement Center and University Facilities Center are nearby. South Campus is linked to other campuses by a free shuttle bus service.

The University's **Memorial Art Gallery** serves as a public art museum serving west-central New York, with representative collections of world art of nearly all major schools and periods and regularly changing exhibitions.

C. E. K. Mees Observatory is located on Gannett Hill in the Bristol Hills south of Rochester.

LIBRARIES

The University library system (see www.rochester.edu/library) houses more than three million volumes and has access to about 22,000 periodicals, in print or online. River Campus libraries include Rush Rhees (humanities, social sciences, and business), Carlson Library (sciences and engineering), and the Physics-Optics-Astronomy Library. Beyond River Campus are Edward G. Miner Library (Medical Center), Sibley Music Library (Eastman School of Music), Charlotte Whitney Allen Library (Memorial Art Gallery), and the library at the Laboratory for Laser Energetics.

SPECIAL ACADEMIC OPPORTUNITIES

Students taking their entire four years as undergraduates in the College receive extra-ordinarily strong grounding in their chosen fields. But the outstanding graduate and professional schools of the University also offer undergraduates many opportunities to study in advanced and specialized areas. With only a few exceptions, students may count credits for courses in any unit of the University toward the bachelor's degree in the College. Graduate study in one's specialty may be taken for credit toward the bachelor's degree by students whose work in a given area is sufficiently advanced.

3-2 PROGRAMS

Five-year combined programs of undergraduate and graduate study (the first three undergraduate, the last two graduate) are available in a number of fields, and permit students to earn a bachelor's degree (awarded after four years) and a professional master's degree. This 3-2 option is available in fields including:

Business administration (page 165)

Computer science (page 144)

Engineering and applied sciences (page 135)

Neuroscience (page 39)

Physics and physics and astronomy (page 108)

Public health (page 123)

SENIOR SCHOLARS PROGRAM

The Senior Scholars Program permits selected seniors to devote at least half of the entire final year to a single capstone project that can range from a piece of scholarly research to a work of artistic creativity. Building on the student's career through the junior year, Senior Scholar projects are marked by intellectual engagement and coherence, and by educational soundness and continuity. The projects may include coursework in addition to independent study. They carry up to 32 hours of academic credit and are composed and carried out under the supervision of faculty advisors. Projects must be completed by the end of the senior year.

"TAKE FIVE" SCHOLARS

The Take Five Scholars Program grants undergraduates a ninth semester or fifth year of study, tuition free, to supplement their regular course requirements. Students may apply any time after they have been accepted into a major through the first semester of their senior year. The program, in place for 20 years, is designed for students who can demonstrate that an additional semester or year of

study will broaden and enhance their undergraduate education.

KAUFFMAN ENTREPRENEURIAL YEAR (KEY) PROGRAM

The University of Rochester is one of eight institutions nationwide selected by the Ewing Marion Kauffman Foundation to receive a major, multiyear grant to make entrepreneurship education an integral ingredient of academic activity. This initiative includes the creation of the Kauffman Entrepreneurial Year (KEY) Program that provides students with the opportunity to devote one or two semesters, tuition free, to the study and practice of entrepreneurship.

Qualified students may propose to devote as much as an entire academic year to internships, special projects, business plan development, research into various facets of entrepreneurship, or analysis of how culture and public policy influence entrepreneurial activity. Participation is open to all undergraduates at the University.

UNDERGRADUATE RESEARCH

As a major research institution, the University actively encourages primary research by undergraduates in the natural sciences, engineering, the social sciences, and humanities. Opportunities for doing hands-on, professionally supervised research in fields as diverse as organic chemistry and medieval history are open to qualified students, both within regular courses and in special independent projects during the regular school year and in summer. For information on such opportunities, contact the Director of Undergraduate Research, Office of the Dean, the College.

CERTIFICATE PROGRAMS

Some students combine their departmental majors with an interdisciplinary specialization by following one of the Certificate Programs—in actuarial studies, Asian studies, literary translation studies, mathematical modeling in political science and economics, and Polish and Central European studies—offered through the College Center for Academic Support. The Undergraduate Program in Physics and Astronomy offers a Certificate in Biological or Medical Physics. In addition, a Certificate in Biotechnology is offered through the Undergraduate Program in Biology and Medicine. The Department of English offers a certificate in Stage Management. These certificates, which give formal recognition to the specialized study, are awarded in addition to the bachelor's degree. A Citation for Achievement in College Leadership is also available to students who have developed their leadership skills in the ways outlined by this program.

INDEPENDENT STUDY, INTERNSHIPS, AND STUDY ABROAD

Independent study courses permit qualified students to pursue areas of reading and research not included or not treated in sufficient depth in regularly offered courses. These special tutorial courses are most often on a one-to-one basis with full-time members of the teaching faculty, with the content and objectives of the course determined by faculty-student collaboration.

Practica are credit courses supervised by University faculty members that usually combine field experience with lectures, seminars, and oral and written reports. Each practicum provides direct personal interaction with working professionals in their everyday environment.

Internships enable students to work in a variety of off-campus settings. Students in arts and sciences, under the supervision of a faculty member, can receive credit for their work. Recent internship placements have included the Rochester District Attorney's office, the Rochester *Democrat and Chronicle*, local television stations, environmental field work for the county, the Memorial Art Gallery, George Eastman House, and various financial and investment offices. In social services internships, students have worked in various programs that help emotionally and physically abused children and the developmentally disabled. With special approval, students may engage in full-time internships away from the Rochester area; examples include research projects at the Federal Reserve and at Cohokia Mounds Historical Site. Opportunities for internships in Washington and abroad are described in the sections that follow.

The *Washington Semester Program*, administered by the Department of Political Science, allows selected students to participate directly in the work of legislators at the national level. Students work full time as staff assistants in the offices of United States senators or representatives for a semester and receive full academic credit. Their activities usually include writing speeches, attending hearings, researching law, taking notes at committee meetings, answering mail, and performing other assignments associated with the political process.

Study Abroad Programs provide qualified students a summer, a semester, or a year of foreign study experience. Currently, more than 70 different Rochester-sponsored opportunities are available in 29 countries. Students are also welcome to take part in programs offered by other American colleges and universities. Options include "on-location" courses taught by Rochester faculty overseas, university exchanges, internships, and traditional study abroad programs. For more information, contact the Center for Study Abroad in 206 Lattimore

Hall.

On-location programs are in Ecuador, Egypt, Italy, France, Germany, Poland, Russia, and England:

Rochester in Arezzo, Italy—a fall-semester program in Italian language, literature, art, and culture. Sponsored by the Department of Modern Languages and Cultures. Open to sophomores, juniors, and seniors.

London Theater Seminar—a "winter term" course offered in London and Stratford in late December to early January. Sponsored by the Department of English.

Month-long summer language courses include Italian in Padua; German in Berlin; French in Rennes (Rochester's sister city in Brittany); Russian in St. Petersburg; and Spanish in Quito, Ecuador. Sponsored by the Department of Modern Languages and Cultures.

Other summer options include French sign language and culture, an archaeological dig in Italy, Literary Egypt, and a Malawi immersion program.

Exchange programs permit Rochester students to "trade places" with their counterparts from overseas universities. Current options are in England, Germany, Israel, Japan, and Sweden:

Sussex University, Sussex, England—a semester or one-year exchange for sophomore or junior brain and cognitive sciences majors. Located in Brighton, one hour south of London.

University of Cologne, Germany—sponsored by the German section of the Department of Modern Languages and Cultures. A full-year program for juniors or seniors to take courses and to teach English. This unique fellowship program also provides a stipend.

ORT-Braude College, Karmiel, Israel—a spring semester program for sophomore and junior engineering and computer science majors. Located in the Galilee, in the north of Israel. Sponsored by the Edmund A. Hajim School of Engineering and Applied Sciences.

Meiji-Gakuin University, Tokyo, Japan—a semester or yearlong program in Japanese language and culture. Sponsored by the Japanese section of the Department of Modern Languages and Cultures.

Uppsala University, Uppsala, Sweden—a semester or year at one of Europe's oldest universities, located 45 minutes from Stockholm. English-language courses in the humanities, social sciences, engineering, and natural sciences.

In addition to these exchanges, universities in Egypt, Israel, and Poland accept visiting Rochester students in special English-language programs. *The American University in Cairo, Egypt,* offers a semester or a full year at this four-year liberal arts college. AUC is noted for its coursework in Arabic language, Islamic art and architecture, Egyptology, and Middle Eastern history, society, and politics. The overseas program at *Ben-Gurion University of the Negev* in Beersheva, Israel, offers full-year and semester study. The program begins with an intensive Hebrew-language course (Ulpan), and classes taught in English include such unique options as pre-medical studies, environmental and desert studies, health and social welfare, Israeli studies, and internships. At the *Hebrew University of Jerusalem,* students attend courses taught in English in history, politics, religion, Judaic studies, economics, and Middle Eastern languages and literatures. Those proficient in Hebrew may enroll in regularly scheduled Hebrew University courses. In Poland, at the Jagiellonian University in Kraków, courses include Polish language, history, Judaic studies, literature, political science, immigration, economics, and sociology. The Jagiellonian University program is sponsored by the University of Rochester's Skalny Center for Polish and Central European Studies.

Internship programs are located in England, Scotland, Belgium, Germany, and Spain and are open to students majoring in a wide variety of fields. Students take coursework paired with a related internship. Semester programs are offered in all locations, and eight-week summer internships (without coursework) are available in all sites except Spain.

London—The *British Politics Internship program* places students as interns with Members of the House of Commons or in the Scottish Parliament, pressure groups, party headquarters, or constituency offices, where they carry out research, write speeches and press releases, and experience the workings of the British political system at close hand. Internships in law offices and other private or governmental agencies, and public policy institutes are also offered. *Business* internships are available in advertising, banking, finance, marketing, and media. *Arts* placements include institutions such as theaters, museums, galleries, and performing arts centers. Students participate in daily operations, including mounting exhibitions, helping to plan projects, and carrying out research. The *Health Science/Medical Research Internship* offers students the opportunity to work as interns either in a research laboratory in one of London's teaching hospitals, in a psychiatric treatment program, or in health care administration in a broad range of facilities.

In *Berlin,* politics interns work with Members of the Bundestag and political offices. In *Bonn,* placements are made in business, law, the arts, museums, and social service agencies. *Brussels* interns work with Members of the European Parliament. Depending on language proficiency, placements are made with MEPs from any of the European Union member nations. Business placements with multi-national corporations are also available. In *Madrid,* students are placed with political offices, businesses, and museums.

Rochester belongs to several consortia that provide access to programs through the *Institute for the International Education of Students (IES),* the *Council on International Educational Exchange (CIEE),* and *Advanced Studies in England (ASE).* Through *IES,* the

University of Rochester provides semester and academic year programs in Argentina, Australia, Austria, Chile, China, Ecuador, France, Germany, India, Ireland, Italy, Japan, Morocco, the Netherlands, New Zealand, South Africa, Spain, and the United Kingdom. *CIEE* semester or year programs are in China, Czech Republic, France, Ghana, Hungary, Poland, Russia, and Senegal. Rochester is also a member of the *Advanced Studies in England* consortium, a semester or yearlong program focusing on British Studies in Bath, Oxford, and Stratford.

Study abroad is open to all majors, and new programs are currently under development. The Center for Study Abroad's advising staff works closely with students to enable them to find the program best suited to their academic interests.

SUMMER STUDY

Summer provides an opportunity for students to study abroad, concentrate on one or two classes, catch up, get ahead, or take a class of interest that normally would not fit into their schedules! Summer classes are offered May–August in sessions of different lengths. For more information or a complete listing of summer courses, visit www.rochester.edu/summer or call (585) 275-2345.

SPECIAL DEGREE PROGRAMS

The interdepartmental degree programs (pages 75 and 158) provide students with an unusual opportunity to construct individual programs suited to their special talents and interests. Students are currently pursuing interdepartmental majors in culture and communications, computers in media, American studies, and Latin-American studies, among others. Faculty members related to the College Center for Study Abroad and Interdepartmental Programs assist undergraduates in developing their interdepartmental studies majors in the School of Arts and Sciences.

Students planning an interdepartmental program leading to a Bachelor of Science in engineering and applied science or the Bachelor of Arts in engineering science work closely with faculty members on the Interdepartmental Engineering Committee in the Edmund A. Hajim School of Engineering and Applied Sciences (page 159).

HONOR SOCIETIES

National academic honorary societies include Phi Beta Kappa, Golden Key, Tau Beta Pi (engineering), National Society of Collegiate Scholars (scholarship, leadership, and service), Beta Gamma Sigma (business, graduate students only), Sigma Theta Tau (nursing), and Alpha Omega Alpha (medicine), Sigma Pi Sigma (physics and astronomy).

Degrees Offered

Degrees are awarded by the University of Rochester in the following subjects, grouped by college or school of the University:

THE COLLEGE:
SCHOOL OF ARTS AND SCIENCES

For purposes of the Rochester Curriculum, described on page 14, the distribution area is noted in which each degree program and minor in the College falls. H=Humanities, S=Social Sciences, N=Natural Sciences and Engineering, V=Variable (determined at time of official entrance into the program).

African and African-American Studies (B.A.)-V
American Sign Language (B.A.)-H
Anthropology (B.A.)-S
*Archaeology, Engineering, and Architecture (B.A.)-V
Art and Art History:
  Art History (B.A.)-H
  Studio Arts (B.A.)-H
Bioethics (B.A.)-H
Biological Sciences (B.S.), with specialties in:
  Biochemistry-N
  Cell and Developmental Biology-N
  Ecology and Evolutionary Biology-N
  Microbiology-N
  Molecular Genetics-N
  Neuroscience-N
Biology (B.A., M.S., Ph.D.)-N
Brain and Cognitive Sciences (B.A., B.S., M.A., Ph.D.)-N
Chemistry (B.A., B.S., M.S., Ph.D.)-N
Earth and Environmental Sciences:
  Environmental Studies (B.A.)-N
  Geological Sciences (B.A., B.S., M.S., Ph.D.)-N
  Geomechanics (B.S.)-N
Environmental Science (B.S.)-N
Economics (B.A., M.A., Ph.D.)-S
Economics and Business Strategies (B.A.)-S
English (B.A., M.A., Ph.D.)-H
Epidemiology (B.A.)-S
Film and Media Studies (B.A.)-H
Financial Economics (B.A.)-S
Health and Society (B.A.)-S
Health, Behavior, and Society (B.A.)-S
Health Policy (B.A.)-S
History (B.A., M.A., Ph.D.)-S
Interdepartmental Studies (B.A., M.A., M.S.)-V
International Relations (B.A.)-S
Linguistics (B.A., M.A.)-S
Literary Translation (M.A.)-H
Mathematics (B.A., B.S., M.A., Ph.D.)-N

Mathematics-Applied (B.S., M.S.)-N
Mathematics-Statistics (B.A., M.A.)-N
Modern Languages and Cultures:
  Comparative Literature (B.A., M.A.)-H
  French (B.A., M.A.)-H
  German (B.A., M.A.)-H
  Japanese (B.A.)-H
  Russian (B.A.)-H
  Spanish (B.A., M.A.)-H
Music (B.A.)-H
Philosophy (B.A., M.A., Ph.D.)-H
Physics (B.A., B.S., M.A., M.S., Ph.D.)-N
Physics and Astronomy (B.A., B.S., Ph.D.)-N
Political Science (B.A., M.A., Ph.D.)-S
Psychology (B.A., M.A.)-S
Psychology, Clinical (Ph.D.)
Psychology, Developmental (Ph.D.)
Psychology, Social-Personality (Ph.D.)
Religion and Classics:
  Classics (B.A.)-H
  Religion (B.A.)-H
Russian Studies (B.A.)-V
Statistics (B.A.)-N
Visual and Cultural Studies (M.A., Ph.D.)
Women's Studies (B.A.)-V

Certificate Programs (taken in conjunction with a bachelor's degree)
  Actuarial Studies
  Asian Studies
  Biophysics
  Biotechnology
  Literary Translation Studies
  Mathematical Modeling in Political Science and Economics
  Medphysics
  Polish and Central European Studies
  Stage Management
  Citation for Achievement in College Leadership

Minors
  African and African-American Studies-V
  American Sign Language-H
  Anthropology-S
  Arabic-H
  Archaeology, Engineering, and Architecture-V
  Art History-H
  Astronomy-N
  Biology-N
  Brain and Cognitive Sciences-N
  Business
  Chemistry-N
  Chinese-H
  Classics-H
  Clinical Psychology-S
  Comparative Literature-H
  Economics-S
  Economics and Business Strategies-S
  English Literature-H

Environmental Geology-N
Ethics-H
Film and Media Studies-H
French-H
Gender Psychology-S
Geological Sciences-N
German-H
Greek-H
Health and Society-S
Health Psychology-S
History-S
History of Philosophy-H
Interdepartmental Studies-V
International Relations-S
Italian-H
Japanese-H
Jewish Studies-H
Latin-H
Latin American Studies-H
Legal Studies-V
Linguistics-S
Marine Geology and Ecology-N
Mathematics-N
Medical Anthropology-S
Music-H
Music Cognition-N
Music and Linguistics-S
Organizational Psychology-S
Paleontology and Evolution-N
Philosophy-H
Philosophy of Science-H
Physics-N
Political Science-S
Psychology-S
Psychology as a Natural Science-N
Psychology as a Social Science-S
Religion-H
Research in Visual Science-N
Russian-H
Russian Studies-V
Social and Emotional Development-S
Spanish-H
Statistics-N
Studio Arts-H
Theater-H
Visual Science-N
Women's Studies-V
Writing-H

THE COLLEGE:
EDMUND A. HAJIM
SCHOOL OF ENGINEERING
AND APPLIED SCIENCES

Biomedical Engineering (B.S., M.S., Ph.D.)-N
Chemical Engineering (B.S., M.S., Ph.D.)-N
Computer Science (B.A., B.S., M.S., Ph.D.)-N

Electrical and Computer Engineering (B.S.)-N
Electrical Engineering (M.S., Ph.D.)-N
Engineering and Applied Science (an Interdepartmental Program) (B.S.)-N
Engineering Science (B.A.)-N
Geomechanics (B.S.)-N
Materials Science (M.S., Ph.D.)
Mechanical Engineering (B.S., M.S., Ph.D.)-N
Optics (B.S., M.S., Ph.D.)-N
Technical Entrepreneurship and Management
(joint program with Simon School) (M.S.)

Minors

Bioenvironmental Engineering-N
Biomedical Engineering-N
Chemical Engineering-N
Computer Science-N
Electrical and Computer Engineering-N
Environmental Engineering-N
Materials Science-N
Mechanical Engineering-N
Optics-N

EASTMAN SCHOOL OF MUSIC

Applied Music (B.M.)
Composition (B.M., M.A., M.M., D.M.A., Ph.D.)
Conducting (M.M., D.M.A.)
Early Music, Emphasis in Historical Plucked Instruments (M.M., D.M.A.)
Ethnomusicology (M.A.)
Jazz Studies and Contemporary Media (B.M., M.M., D.M.A.)
Musical Arts (B.M.)
Music Education (B.M., M.A., M.M., D.M.A., Ph.D.)
Music Theory (B.M., M.A., Ph.D.)
Musicology (M.A., Ph.D.)
Opera (M.M.)
Pedagogy of Music Theory (M.A.)
Performance and Literature (M.M., D.M.A.)
Piano Accompanying and Chamber Music (M.M., D.M.A.)

SCHOOL OF MEDICINE
AND DENTISTRY

Biochemistry (M.S., Ph.D.)
Biophysics (M.S., Ph.D.)
Clinical Investigation (M.S.)
Dental Science (M.S.)
Epidemiology (Ph.D.)
Genetics (M.S., Ph.D.)
Health Services Research and Policy (Ph.D.)
Marriage and Family Therapy (M.S.)
Medical Statistics (M.S.)
Medicine (M.D.)
Microbiology (M.S.)
Microbiology and Immunology (Ph.D.)
Neurobiology and Anatomy (M.S., Ph.D.)
Neuroscience (M.S., Ph.D.)
Pathology (M.S., Ph.D.)
Pharmacology (M.S., Ph.D.)

Physiology (M.S., Ph.D.)
Public Health (M.P.H.)
Statistics (M.A., Ph.D.)
Toxicology (M.S., Ph.D.)
Translational Research (M.S.)
Translational Biomedical Science (Ph.D.)

SCHOOL OF NURSING

Bachelor Programs:
- Nursing—R.N. to B.S.
- Accelerated Programs for Non Nurses

Nursing (B.S.)/M.S. Accelerated Programs for Non Nurses:
- Nursing/Acute Care Nurse Practitioner
- Nursing/Adult Nurse Practitioner
- Nursing/Adult Nurse Practitioner/Geriatric Nurse Practitioner
- Nursing/Care of Children & Families—Pediatric Nurse Practitioner
- Nursing/Care of Children & Families—Pediatric Nurse Practitioner with Pediatric Behavioral Health
- Nursing/Child and Adolescent Psychiatric/Mental Health Nurse Practitioner
- Nursing/Family Nurse Practitioner
- Nursing/Psychiatric/Mental Health Nurse Practitioner

R.N. to B.S. to M.S. Programs:
- Nursing/Acute Care Nurse Practitioner
- Nursing/Adult Nurse Practitioner
- Nursing/Adult Nurse Practitioner/Geriatric Nurse Practitioner
- Nursing/Care of Children & Families—Pediatric Nurse Practitioner
- Nursing/Care of Children & Families—Pediatric Nurse Practitioner with Pediatric Behavioral Health
- Nursing/Care of Children & Families—Pediatric Nurse Practitioner/Neonatal Nurse Practitioner
- Nursing/Child and Adolescent Psychiatric/Mental Health Nurse Practitioner
- Nursing/Family Nurse Practitioner
- Nursing/Psychiatric Mental Health Nurse Practitioner

M.S. Programs:
- Acute Care Nurse Practitioner
- Adult Nurse Practitioner
- Adult Nurse Practitioner/Geriatric Nurse Practitioner
- Care of Children & Families—Pediatric Nurse Practitioner
- Care of Children & Families—Pediatric Nurse Practitioner/Neonatal Nurse Practitioner
- Care of Children & Families—Pediatric Nurse Practitioner with Pediatric Behavioral Health
- Child & Adolescent Psychiatric Mental Health Nurse Practitioner
- Family Nurse Practitioner
- Psychiatric/Mental Health Nurse Practitioner (Adult/Family)

M.S./Ph.D. Programs:
- Acute Care Nurse Practitioner/Nursing
- Adult Nurse Practitioner/Nursing
- Care of Children & Families—Pediatric Nurse Practitioner/Neonatal Nurse Practitioner/Nursing
- Care of Children & Families—Pediatric Nurse Practitioner/Nursing
- Family Nurse Practitioner/Nursing
- Psychiatric/Mental Health Nurse Practitioner/Nursing

D.N.P. Program

Ph.D. Program:
- Health Practice Research

WILLIAM E. SIMON GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

Business Administration (M.S., M.B.A., Ph.D., M.B.A./Master of Public Health, M.D./M.B.A., M.S. in Accountancy, and graduate-level certificate programs)

MARGARET WARNER GRADUATE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

The list of Warner programs/degrees is presented to give a clear sense of program focus. Technically, some of the programs award degrees in Education with a concentration in the specialty areas listed below.

Counseling
- School Counseling (M.S.)
- Mental Health Counseling (M.S., Ed.D.)
- Counseling and Human Development (Ed.D.)
- Counseling and Counselor Education (Ph.D.)

Educational Administration (M.S., Ed.D.)
Educational Policy and Theory (Ph.D.)
Higher Education (M.S., Ed.D., Ph.D.)
Human Development (M.S., Ed.D., Ph.D.)
Teaching and Curriculum
- Early Childhood Education (M.S.)
- Childhood Education (M.S.)
- Adolescence Education (M.S., M.A.T.)
- Inclusive/Special Education (as an additional certification with programs listed above)
- TESOL (Teaching English to Speakers of Other Languages) (M.S.)
- Reading and Literacies (M.S.)
- Teaching and Curriculum (M.S., Ed.D.)
- Teaching, Curriculum and Change (Ph.D.)

UNIVERSITY-WIDE STUDIES

Combined Bachelor's Programs
B.A. and B.S. in arts and sciences
B.A. or B.S. in arts and sciences and B.S. or B.A. in engineering and applied sciences
B.A. or B.S. in arts and sciences and B.M. in music
B.S. in engineering and applied sciences and B.M. in music

3-2 Programs
B.A. and B.S. in an engineering concentration (for transfer students)
B.A. or B.S. plus an M.B.A.
B.A. or B.S. plus a master's in public health
B.S. and M.S. in biological sciences—neuroscience
B.S. and M.S. in biomedical engineering
B.S. and M.S. in chemical engineering
B.S. and M.S. in electrical and computer engineering
B.S. and M.S. in mechanical engineering
B.S. and M.S. in optics

Combined Bachelor's and M.D. Degree Program
B.A. or B.S. plus an M.D.

Concurrent Master's Programs
M.B.A. and M.S. in microbiology

Inter-College Degree Programs
Genetics (Ph.D.)
Neuroscience (M.S., Ph.D.)

Academic Calendar

ARTS AND SCIENCES AND ENGINEERING*

2009 FALL SEMESTER

September 1 (Tuesday)
Classes begin at the College.

September 7 (Monday)
Labor Day. No classes.

September 21 (Monday)
Last date for students in the College to add independent study courses.

September 29 (Tuesday)
Last date for students in the College to have courses deleted from current program.

Last date for students in the College to add courses.

October 2 (Friday)
Fall term break begins at close of classes for the College.

October 6 (Tuesday)
Classes resume.

October 22–23
Registration materials distributed to undergraduates in the College.

October 26–November 6
Undergraduate program advising in the
College.

November 9
Undergraduate registration begins.

November 18 (Wednesday)
Last day to declare S/F or withdraw from courses for undergraduates in Arts, Sciences and Engineering.

November 25 (Wednesday)
Thanksgiving recess begins at noon.

November 30 (Monday)
Classes resume.

December 4 (Friday)
Last date for first-semester freshmen and transfer students in the College to declare the S/F option.

December 11 (Friday)
Classes end.

December 11 (Friday)
Reading period begins at close of classes (optional by college or school offering course).

December 14 (Monday)
Reading period ends.

December 15–21

Final examinations.

December 21 (Monday)
Winter recess begins at end of examinations.

2010 SPRING SEMESTER

January 13 (Wednesday)
Classes begin at the College.

January 18 (Monday)
Martin Luther King Day (observed).
Classes Canceled.

February 2 (Tuesday)
Last date for students in the College to add independent study courses.

February 9 (Tuesday)
Last date for students in the College to have courses deleted from current program.

Last date for students in the College to add courses.

March 6 (Saturday)
Spring recess begins at close of classes.

March 15 (Monday)
Classes resume.

March 18–19
Registration materials distributed to undergraduates in Arts, Sciences and Engineering.

March 22–April 2
Undergraduate program advising in the
College.

April 5
Undergraduate registration begins.

April 6
Last day to declare S/F or withdraw from courses for undergraduates in Arts, Sciences and Engineering.

April 20 (Tuesday)
Last date for first-semester freshmen and transfer students in the College to declare the S/F option.

April 28 (Wednesday)
Classes end.

April 28 (Wednesday)
Reading period begins at close of classes (optional by college or school offering course).

May 2 (Sunday)
Reading period ends.

May 3–10
Final examinations.

May 14–16
Commencement Weekend.

2010 SUMMER

May 17–August 6
Full summer session

May 17–June 11
Session A-4

May 17–June 25
Session A-6

May 31 (Monday)

Memorial Day observed. No classes.

June 14–July 9
Session B-4

July 5 (Monday)
Independence Day observed. No classes.

June 28–August 6
Session B-6

July 12–August 6
Session C-4

2010 FALL SEMESTER

September 1 (Wednesday)
Classes begin.

September 6 (Monday)
Labor Day. No classes.

September 22 (Wednesday)
Last date for students in the College to add independent study courses.

September 29 (Wednesday)
Last date for students in the College to have courses deleted from current program.

October 8 (Friday)
Fall term break begins at close of classes for the College.

October 12 (Tuesday)
Classes resume.

October 21–22
Registration materials distributed to undergraduates in the College.

October 25–November 5
Undergraduate program advising in the
College.

November 8 (Monday)
Undergraduate registration begins.

November 18 (Thursday)
Last day to declare S/F or withdraw from courses for undergraduates in Arts, Sciences and Engineering.

November 24 (Wednesday)
Thanksgiving recess begins at noon.

November 29 (Monday)
Classes resume.

December 6 (Monday)
Last date for first-semester freshmen and transfer students in the College to declare the S/F option.

December 13 (Monday)
Classes end.

December 13 (Monday)
Reading period begins at close of classes (optional by college or school offering course).

December 15 (Wednesday)
Reading period ends.

December 16–22
Final examinations.

December 22 (Wednesday)
Winter recess begins at end of examinations.

2011 SPRING SEMESTER

January 12 (Wednesday)
Classes begin at the College.

January 17 (Monday)
Martin Luther King Day (observed).
Classes Canceled.

February 1 (Tuesday)
Last date for students in the College to add independent study courses.

February 8 (Tuesday)
Last date for students in the College to have courses deleted from current program.
Last date for students in the College to add courses.

March 5 (Saturday)
Spring recess begins at close of classes.

March 14 (Monday)
Classes resume.

March 17–18
Registration materials distributed to undergraduates in the College.

March 21–April 1
Undergraduate program advising in the
College.

April 4 (Monday)
Undergraduate registration begins.

April 5 (Tuesday)
Last day to declare S/F or withdraw from courses for undergraduates in Arts, Sciences and Engineering.

April 19 (Tuesday)
Last date for first-semester freshmen and transfer students in the College to declare the S/F option.

April 27 (Wednesday)
Classes end.

April 27 (Wednesday)
Reading period begins at close of classes (optional by college or school offering course).

May 1 (Sunday)
Reading period ends.

May 2–9
Final examinations.

May 13–15
Commencement Weekend.

2011 SUMMER

May 16–August 5
Full summer session

May 16–June 10
Session A-4

May 16–June 24
Session A-6

May 30 (Monday)
Memorial Day observed. No classes.

June 13–July 8
Session B-4

July 4 (Monday)
Independence Day observed. No classes.

June 27–August 5
Session B-6

July 11–August 5
Session C-4

The College

ADMINISTRATIVE OFFICERS

Peter Lennie, Ph.D. (Cambridge) *Senior Vice President and Robert L. and Mary L. Sproull Dean of the Faculty of Arts, Sciences, and Engineering*
Joanna B. Olmsted, Ph.D. (Yale) *Dean, School of Arts and Sciences*
Paul F. Slattery, Ph.D. (Yale) *Dean of Research*
Richard Feldman, Ph.D. (Massachusetts)
Dean of the College
Robert L. Clark, Ph.D. (Virginia Polytechnic
Institute and State University) *Dean, Edmund A. Hajim School of Engineering and Applied Sciences*
Wendi Heinzelman, Ph.D. (M.I.T.) *Dean of Graduate Studies*
Thomas DiPiero, Ph.D. (Cornell) *Senior Associate Dean of Humanities*
Thomas Y. Hsiang, Ph.D. (California, Berkeley) *Associate Dean for Undergraduate Programs, School of Engineering and Applied Sciences*
Suzanne J. O'Brien, B.A. (Rochester)
Associate Dean of the College
Marcy Kraus, Ph.D. (New Hampshire)
Dean of Freshmen and Director, College Center for Academic Support
Jacqueline Levine, M.A. (Rochester)
Assistant Dean and Director of Study Abroad
Burton J. Nadler, M.A. (Stanford) *Assistant Dean and Director of the Career Center*
Deborah F. Rossen-Knill, Ph.D. (Minnesota) *Director of College Writing Program*
Vicki Roth, M.A. (Minnesota) *Assistant Dean for Learning Assistance Services and Dean for Sophomores*
Nancy Speck, B.A. (American University) *Assistant Dean for Institutional Research and Registrar*
Ovide Corriveau, B.A. (St. Anselm College) *Senior Operations Officer for the College*
Jessica Foster, M.B.A. (Rochester) *Senior Administrative Officer*
Steven Manly, Ph.D. (Columbia) *Director of Undergraduate Research*
Stephen Taylor, M.B.A. (Rochester Institute of Technology) *Senior Financial Officer*

The College encompasses the School of Arts and Sciences and the School of Engineering and Applied Sciences, that together enroll the majority of University undergraduate and graduate students. For undergraduates especially, it is a college home at the heart of a nationally respected institution.

The College offers degree programs leading to the Bachelor of Arts and to the Bachelor of Science. In addition, it provides the first three years for students admitted to 3-2 programs offered in conjunction with other schools of the University, and the full course of study for 3-2 programs in computer science, engineering, neuroscience, optics, and applied mathematics.

THE ROCHESTER CURRICULUM

In the American system of education, college is the time in which a student's intellectual growth and personal growth coincide—as he or she gains the ability to make a series of critical choices.

Most of education through the 12th grade, and most of graduate and professional training, is mandated by someone else—a school board, an accrediting agency, the demands of a profession or a career. In America, it is uniquely in the college years that students choose their subjects and thereby sharpen their interests, develop their skills, and focus their goals. Through the freedom of the so-

called modular system of education that marks American undergraduate learning, students grow as thinkers and as persons.

The Rochester Curriculum takes the special character of college education seriously and attempts to craft a structure of learning that both respects the student as an individual learner and takes full advantage of Rochester's character as a research university. University researcher/teachers are self-motivated learners, people who every day work to sharpen understanding and create new knowledge. More than any other group in society, a university research faculty knows how to make learning the habit of a lifetime. The basic aim of the Rochester Curriculum is to break down the barriers between the way the faculty learn and the students learn so that students can make not just the content, but also the practice, of disciplined learning their own. The Rochester Curriculum is distinctive among American universities.

Students at Rochester are encouraged to explore a variety of disciplines during their freshman year. As a student progresses at Rochester, he or she chooses a major, with at least 10 semester courses, in either the humanities, social sciences, or natural sciences (including mathematics and engineering). In addition, the student chooses a cluster of three related courses in each of the other two main divisions of the liberal arts named above. Students with a major in an accredited program in engineering only need to select one cluster.

More than 250 authorized clusters exist from which students may choose. Virtually every department and program in the College offers numerous clusters that meet the spirit of the Rochester Curriculum. Complete descriptions can be found on the Web at www.rochester.edu/College/CWRT/clusters/. Examples from the humanities include Modern and Contemporary Literature, Japanese Language, Ethics and Values. From the social sciences division, examples include Applied Economics, African-American Politics, Psychology of Motivation. In the natural sciences division, examples include Mind and Brain, Foundations of Computer Science, The Nature of the Universe.

The opportunity exists for students to propose exceptions to already existing clusters, and—with the support of two faculty sponsors—students may also propose individualized interdepartmental divisional clusters. Final approval rests with the Curriculum Committee.

The Rochester Curriculum is simple, flexible, and reflects the true hallmarks of university life and learning—curiosity, competence, and community.

Curiosity—The most important discoveries in the history of science, the most enduring works of art and literature, and the most compelling theories of society are the consequences of curiosity—which brings with it scholarly or artistic energy and persistence that won't let a question rest until it is answered. The freedom to follow one's own curiosity is the prime motivator of faculty learning, and it works just as well for undergraduates as it does for faculty. Therefore, we do not restrict our students' freedom with a system in which they must take required courses to "get them out of the way." Instead, we ask students to take responsibility and build their college education out of their own interests, goals, and aspirations. Broad and free experimentation with ideas and subjects allows them to discover and sharpen their own interests and to learn their own strengths and weaknesses.

Competence—We believe that for students to understand how a field of learning actually works, they need to spend sufficient time in it to learn its language, become familiar with its artifacts, and experience its logic. The Rochester Curriculum allows them to do so—not just in their major, but also in two other fields across the liberal arts disciplines. A key mark of a Rochester education is a demonstrable competence in the three major realms of thought and analysis and the consequent ability to make informed intellectual connections across fields and disciplines.

Community—Curiosity does not thrive in isolation, and our researchers do not—indeed, cannot—work alone. Active participation in a community of inquiry and expertise, engagement in a heritage of curiosity, is a fundamental ingredient of the intellectual life in a research culture. By providing the framework for a major and two clusters, the Rochester Curriculum invites students into three different intellectual communities—three different sustained conversations about learning and ideas—during their undergraduate careers.

ARTS AND SCIENCES REQUIREMENTS FOR THE DEGREES BACHELOR OF ARTS AND BACHELOR OF SCIENCE

To ensure that students acquire a broad base of general knowledge, as well as extensive familiarity with at least one area of specialization, the College has established general de-gree requirements. These requirements are identical for the B.A. and B.S. degrees.

1. Completion of eight semesters of approved coursework, i.e., 32 4-credit courses or 128 credit hours, with an average grade of "C'' or better. No more than 20 courses from a single department, no more than three courses from naval science, and no more than 8 credit hours of dance technique may be counted toward the degree. For students not majoring in music, no more than 16 credit hours of applied music instruction and 8 credit hours of River Campus ensemble may be counted toward the degree.

2. Primary Writing Requirement. Entering students fulfill the Primary Writing Requirement by earning a C or better in WRT 105 (for-

merly CAS 105), Reasoning and Writing in the College, or WRT 105E (formerly CAS 105E), an extended version of 105 developed for students whose placement results suggest that they need a more supportive first-year writing experience. WRT 105 and 105E introduce students to academic writing at the college level and provide instruction and practice in writing clear and cogent argumentative essays. Individual sections of 105 and 105E have unique discipline-specific content and themes designed by each instructor. For section titles and descriptions, please visit http://writing.rochester.edu/courses/index.html. We encourage students to choose sections that interest them, whether this interest grows out of a desire to learn more about a favorite subject or to try something new.

Incoming freshmen who believe they are proficient college writers may petition to use a course other than WRT 105 or 105E to satisfy the Primary Writing Requirement. The course must involve a significant writing component, which usually includes several papers across the semester and a substantial research paper. The course used to satisfy the Primary Writing Requirement must be approved by the Writing Program (we recommend preapproval) and may not also be used to satisfy the Upper-Level Requirement. The student must earn a B in the alternate course in order to satisfy the Primary Writing Requirement.

3. Completion of the Rochester Curriculum.

a. Satisfactory completion of a major with an average grade of "C" or better. Each major contains an upper-level writing requirement which explicitly incorporates student writing into its curriculum and/or requirements. Students are expected to file their major program after getting it approved by the appropriate faculty advisor in the department or program by the time noted below. The divisional classification of all interdepartmental majors, as noted in the following paragraph, is determined by the student and the faculty committee responsible for the major.

b. Satisfactory completion, with an average grade of C or better, of an approved divisional cluster composed of at least three courses in *each* of the two divisions outside the area of the major. Each set of courses for the divisional clusters will be in one of the three divisions: humanities; social sciences; natural science, mathematics, and engineering and applied sciences. Students may also construct a program from existing majors and minors, as long as the principle of distribution over the three divisions is maintained. Students who complete an engineering major that is professionally accredited need to complete only one divisional cluster outside the area of the major.

Students formally declare their Rochester Curriculum, i.e., their major and two divisional clusters, not later than the beginning of their junior year (by the time 64 credit hours have been taken). Students may alter their program until the final semester of the senior year. The College transcript will reflect the student's three areas of focus.

Departments of the College discourage students from registering for the next course in a continuing science sequence if an appropriate grade level ("C–'' or above) has not been achieved in the preceding course. It has been shown that a student's success in such a sequence is directly related to performance in
the preceding course. Students so advised are asked to seek assistance in their future program planning from the College Center for Academic Support and from their faculty advisors.

COLLEGE WRITING PROGRAM

INFORMATION ABOUT THE PROGRAM

Faculty across the College agree that mastery of the skills of written argument, including critical thinking, problem solving, organization of ideas, and clarity and power of expression, is of enormous importance both in academic work during residence in the College and in the world beyond the College. Writing as part of college life is a given, whether by students completing required coursework, by scholars as part of their professional lives, or by those who find in writing a source of discovery and pleasure. Writing is how we know what it is that we know, because our ability to explain a subject clearly and precisely is an ultimate test of having learned it. To help students join Rochester's community of writers and researchers, the Writing Program offers writing courses and writing support services, as well as opportunities to celebrate outstanding writers and their work.

COURSES

WRT 105 and WRT 105E both satisfy the Primary Writing Requirement. Each section has unique content. For an updated list of course descriptions, please refer to http://writing.rochester.edu/descriptions.html.

WRT 105. Reasoning and Writing in the College. Introduces students to disciplinary writing at the college level through instruction in small sections that focuses on the act of writing. Section topics have ranged from "Reforming America's Schools" to "Dear Diary: Private Lives on Public Display," and cover a range of subjects and disciplines. The course provides instruction and practice in clear and effective writing and in constructing cogent and compelling arguments, as students draft and revise numerous papers of different forms and lengths. Students consider the roles of audience and purpose in shaping the organization, style, and argumentative strategies of their own papers, while they learn to become critical readers of their writing through peer critiques and revision/editing workshops.

WRT 105E. Reasoning and Writing in the College. An extended version of WRT 105, WRT 105E also introduces students to disciplinary writing at the college level. WRT 105E courses differ in that they include an additional class section each week, are taught in computer labs, and are limited to 10 students. Places in these sections are reserved for students whose writing-placement

results suggest the need for more support to meet the demands of college and professional writing.

Prerequisites for the following course: satisfaction of the primary writing requirement. By application only.
WRT 245/ENG 285. Advanced Writing and Peer Tutoring. This course prepares sophomores and juniors from the humanities, sciences, and the social sciences for work as writing fellows. The course design facilitates the development of a strong, intuitive writer and speaker in order to become a successful reader, listener, and responder in peer-tutoring situations. Ample writing and rewriting experiences, practice in informal and formal speaking, and the critical reading of published essays and student work enhance students' ability to become conscious, flexible communicators. Before tutoring on their own, students observe Writing Fellows and Writing Center consultants conduct tutoring sessions. On completion of the course with a B or better, Fellows should be prepared to accept their own hours as peer tutors.

FRESHMAN OFFERINGS

Students have maximum flexibility in course choice, the ability to start working toward a desired major from the first semester on, and the opportunity to build a general foundation according to their own special interests. Assisted by an advisor, students choose an appropriate group of courses (usually four each semester) from the entire range of offerings open to freshmen. Some of these courses lay a basis for a choice of major. Others fulfill basic requirements for graduation and provide the first college-level steps toward a liberal education.

Freshmen also have the opportunity to enroll in Quest courses.

Quest courses involve exciting work with original materials and data and encourage conversation and collaboration between teacher and student and among students themselves. Because of the small size of most Quest courses, students interact closely with their classmates and -professor.

In the *humanities* Quest courses, students delve into analysis and interpretation of primary sources such as letters, authors' original writings and revisions, and films. In *social sciences* Quest courses, students scrutinize existing data, conduct research that yields new data, and learn techniques for data collection and analysis. *Science and engineering* Quest courses draw students into the generation and analysis of new experimental data.

When students study primary sources, their best insights typically occur when they review their material for a second (or third, or fourth) time. That's why Quest courses feature "recursion," the perspective of the second look.

For information about Quest offerings, see www.rochester.edu/college/CCAS/quest/index.html.

EARLY CONNECTION OPPORTUNITY

The Early Connection Opportunity (ECO) program is designed to assist students in acquiring the attitudes, skills, and social connections necessary to become successful University of Rochester students. The program provides supplemental academic support to selected pre-freshmen during a four-week summer program. ECO is a residential program that takes place in the month of July. Students admitted through the Higher Education Opportunity Program are required to attend as a condition of admission, and others are invited who we believe would profit from the connections that can be made during this program. Enrollment is limited. No fees, no tuition, and no room and board costs are charged to participating students. Students are responsible for transportation costs to and from Rochester and all other personal expenses.

Model courses in selected areas, such as mathematics, writing, literature, and biology and chemistry are offered. A series of workshops on strategies and tactics to promote academic success and using the University's computer facilities are also offered. Courses are taught by instructional faculty representing various departments in the University. Upon successful completion of ECO courses students earn 4 credits (the equivalent of one full college course). One or 2 credits may be earned in follow-up courses during the academic year.

EXTRA-DEPARTMENTAL COURSES

Each semester the College offers a variety of courses that are unique or interdisciplinary in nature, reflecting the current interests of students and faculty. These courses are listed under the heading CAS in the Schedule of Courses, the Course Description Handbook, and in the Registration and Resource Guide for nonmatriculated students. Expanded descriptions, of these and other noncredit professional and personal development courses, are available each se-mester, and questions regarding these courses may be directed to the Office of Special Programs in Lattimore Hall.

ACHIEVEMENT IN COLLEGE LEADERSHIP

The Citation for Achievement in College Leadership Program offers students the opportunity to develop their leadership skills through "leadership experiences" that combine specific academic study with specific practical application.

COMMITTEE ON ACHIEVEMENT IN COLLEGE LEADERSHIP

Joseph P. Dinnocenzo, Ph.D. (Cornell)
Professor of Chemistry and Chair of the Committee
Anthony J. Olek, Ph.D. (SUNY, Albany)
Senior Lecturer in Biology
Deborah Rossen-Knill, Ph.D. (Minnesota)
Director of College Writing Program
Vicki Roth, M.A. (Minnesota) *Assistant Dean of Learning Assistance Services; Dean of Sophomores*

REQUIREMENTS FOR A CITATION FOR ACHIEVEMENT IN COLLEGE LEADERSHIP

Students interested in the citation need to successfully complete at least *three different* leadership experiences from the approved list available in the Center for Academic Support. Each leadership experience has two components:
1. An academic course (2-credit minimum) designed to prepare students for specific leadership work.
2. A specific leadership practicum which implements ideas from the preparatory course.

The Citation for Achievement in College Leadership is administered through the College Center for Academic Support. Students who plan to enroll in the program should pick up a registration form at the Academic Services Counter outside 312 Lattimore Hall. No later than the spring semester of the junior year, students should meet with an advisor in Academic Support to review and submit the completed registration form.

Upon graduation, students successfully completing the Citation for Achievement in College Leadership receive a notation on their official transcript.

ACTUARIAL STUDIES

The College offers a certificate in actuarial studies for students contemplating a profes-sional career in the insurance industry. The program is organized by a committee of repre-sentatives from the Departments of Statistics, Mathematics, and Economics, with one member designated as program advisor, and administered through the College Center for Academic Support (in 312 Lattimore Hall). Ordinarily, interested students should apply
by March 1 of their junior year.

COMMITTEE ON ACTUARIAL STUDIES

S. R. S. Rao, Poduri Ph.D. (Harvard)
Professor of Statistics in the Department of Mathematics and of Biostatistics; Chair of the Committee and Program Advisor
Carl Mueller, Ph.D. (Berkeley) *Professor of Mathematics*

REQUIREMENTS FOR A CERTIFICATE IN ACTUARIAL STUDIES

The course requirements are
Five core courses:
1. STT 212 or ECO 231 (prerequisites for ECO 231: ECO 207; ECO 230, STT 213)

2. MTH/STT 201 (prerequisites: MTH 162 or equivalent, MTH 164 recommended)
3. MTH/STT 203 (prerequisite: MTH/STT 201)
4. MTH 164 (prerequisite: MTH 143, 162, or 172)
5. FIN 205 or MTH 210 or ECO 216 (prerequisites: ECO 207, 230 or equivalent). (ECO 216 no longer offered.)

Two additional courses (totaling at least six credits):
One from the following list:
• MTH/STT 208, MTH/STT 280, STT 216, 221

One additional course, either from the above list, or the following list, or an approved substitute:
• ECO 236 or Independent Study (approved by the program advisor)

For certification, students must complete these course requirements with a grade-point average of 2.5 or higher. None of the certificate courses may be taken satisfactory/fail. In addition, some proficiency in a high-level computer language is required. CSC 108, 171, ECE 171, STT 277, and 278 are among the courses that may be used to satisfy the computing requirement. (*Please note:* Course substitutions may be possible with the approval of the program advisor.)

Many insurance companies offer summer internships for students contemplating the actuarial profession. Such an internship may provide important additional training, as well as summer income.

The Society of Actuaries is the professional organization of actuaries in the United States and Canada. To become an Associate Member of the Society, one must pass a series of examinations. Some or all of these may be taken while employed, after college graduation; some may be taken while still a student. The first examination is in calculus and linear algebra, and the courses MTH 161, 162, and 164 provide most of the necessary background. The second examination is in probability and statistics, covered by courses MTH/STT 201 and 203 and STT 212 or 213. Certificate students could, and are strongly encouraged to, take the first two examinations before, or upon, graduation. The exams are given three times a year: February, May, and November.

At graduation, students successfully completing the actuarial studies program receive a certificate in their departmental diploma ceremony.

AFRICAN AND AFRICAN-AMERICAN STUDIES

The Frederick Douglass Institute for offers an interdisciplinary major in African and African-American studies.

EXECUTIVE COMMITTEE

John Michael, Ph.D. (Johns Hopkins) *Professor of English and of Visual and Cultural Studies*
Sharon Willis, Ph.D. (Cornell) *Professor of Art History and of Visual and Cultural Studies*
Signithia Fordham, Ph.D. (American Univer-sity) *Associate Professor of Anthropology*
Larry E. Hudson, Jr., Ph.D. (Keele University, UK) *Associate Professor of History*
Cilas Kemedjio, Ph.D. (Ohio State) *Associate Professor of French; Curriculum Director*
Joan Saab, Ph.D. (N.Y.U.) *Associate Professor of Art History and of Visual and Cultural Studies*
Jeffrey Tucker, Ph.D. (Princeton Uni-versity) *Associate Professor of English; Director of the Institute*
Victoria Wolcott, Ph.D. (University of Michigan) *Associate Professor of History*
Valeria Sinclair-Chapman, Ph.D. (Ohio State) *Assistant Professor of Political Science*

The Frederick Douglass Institute for African and African-American Studies sponsors programs of teaching and research at the undergraduate level. As part of the College, the Institute has a broad mandate in undergraduate and graduate education, advanced research, and exchange within the University community and beyond. It is the focal point for African and African-American studies at

the University.

The undergraduate concentration in African and African-American studies, (AAS) provides an interdisciplinary program of studies that integrates the social sciences (history, political science, anthropology, psychology, economics) and the humanities (English, modern lan-guages and cultures, religion and classics, music, philosophy). Students follow a rigorous and closely monitored concentration designed to facilitate both broad exposure and in-depth mastery of a field which has, in the last 20 years, rapidly established itself as a crucial focus in a broad array of disciplines.

The concentration in African and African-American studies is multidisciplinary and interdepartmental. It brings together historical, cultural, psychological, economic, and political approaches and perspectives to the study of people of African descent in the Atlantic world, including the United States, the Caribbean, Latin America, Europe, and the African continent. The AAS concentration—which may be individually tailored to focus on either the humanities or the social sciences—appeals to students with primary interests in African and African-American studies as well as students working in more traditional, departmentally based majors who may concentrate in African and African-American studies as an additional or double major. Many students already majoring in history, English, political science, comparative literature, anthropology, or similar disciplines find a second major in African and African-American studies an attractive option. Students majoring in engineering or the natural sciences may find a double major in African and African-American studies an enriching opportunity as well.

Institute courses are cross-listed with those of anthropology, economics, history, English, modern languages and cultures, political science, chemical engineering, women's studies, and religion and classics.

In addition to the courses offered, the Institute sponsors an annual Residential Fellow-ship Program (postdoctoral and predoc-toral).

REQUIREMENTS FOR CONCENTRATION IN AFRICAN AND AFRICAN-AMERICAN STUDIES

Ten courses are required for a concentration in African and African-American studies:

1. One course from the following list:
- History 165 (AAS 141). African-American History I
- History 166 (AAS 142). African-American History II
- History 106 (AAS 106). Colonial and Contemporary Africa
- History 110 (AAS 110). Introduction to African and African-American Studies

2. AAS 297. Colloquium in African and African-American Studies

3. Seven electives in African and African-American studies as indicated by AAS cross-listings of which
- Not more than two can be at the 100 level
- At least four must be grouped in either social sciences or humanities
- At least one must address foundational or methodological issues in an established discipline. See the curriculum director for a list of possible courses that satisfy this requirement in specific disciplines.

4. The Senior Seminar (or the Senior Tutorial when the seminar proves impossible or impractical).

The divisional identity of the AAS major (social sciences or humanities) will be determined by that of the majority of the students' elective courses.

REQUIREMENTS FOR THE MINOR IN AFRICAN AND AFRICAN-AMERICAN STUDIES

Seven courses are required for the minor in African and African-American studies:

1. One course from the following list:
- History 165 (AAS 141). African-American History I
- History 166 (AAS 142). African-American History II
- History 106 (AAS 106). Colonial and Contemporary Africa
- History 110 (AAS 110). Introduction to African and African-American Studies

2. Four courses in African and/or African-American studies, at least three of which must be at the 200 or 300 level; these courses must cover at least two different disciplines.

The divisional identity of the AAS minor (social sciences or humanities) will be determined by that of the majority of the students' elective courses.

THE UPPER-LEVEL WRITING REQUIREMENT

The upper-level writing requirement is satisfied by the Colloquium and the Senior Seminar.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

102. Language and Social Identity in the United States. This course examines the relationships between language and social diversity in the general American speech community. Its aim is to shed light on how individuals and social groups distinguish themselves on the basis of their choice of language and their sharing (or lack of it) of a common norm of social evaluation and interpretation. Same as LIN 102. (Fall)

106. Colonial and Contemporary Africa. The course explores the impact of capitalism on African socioeconomic institutions during and after the era of formal colonialism. Same as HIS 106. (Fall)

107. History of Islam. This course traces the development of the religion of Islam from its origins in the Qur'an and Muhammad's teachings, through the codification of the classical tradition in its various forms, and finally to the living Islam of the contemporary world. Same as REL 107. (Fall)

110. Introduction to African-American Studies. Drawing on the disciplines of history, anthropology, and psychology, HIS 110 introduces students to the interdisciplinary approach to the examination of the black experience in America. Same as HIS 110. (Spring)

141. Afro-American History I. The course considers the cultural and political develop-ment of Africans in America from the seventeenth century to the end of the nineteenth century. Same as HIS 165. (Spring)

142. Afro-American History II. An examination of some of the most salient issues of American society since 1900. The course begins with an examination of those changes—political, psychological, social, attitudinal, and geographical—that Americans, black and white, have experienced. It then examines the ideologies that have guided racial advancement efforts and organization upon their inception, as well as state and federal policies in regard to equality. The problems of segregation and discrimination are discussed in depth, along with interracial efforts that have promoted equality of opportunity and equal justice. This course is intended for students with an interest in twentieth-century America. Same as HIS 166.

151. The Blues. The course is about the history and influence of the music known as "the Blues." The course covers development of the blues from the earliest practitioners to recent developments. Same as REL 151. (Spring)

156. Introduction to African-American Literature. This is a survey course that examines various fiction and nonfiction texts by African-American writers from the eighteenth century to the present. Same as ENG 116. (Fall)

171. Civil Rights in America. This course examines the civil rights movement in twentieth-century America, focusing on the post–1945 period. To view civil rights from a local perspective, the course studies the movement in a variety of locations: from the rural south to the urban north. In addition to examining the nonviolent struggle for integration in the South, activist demands for better housing, jobs, and economic parity nationwide are discussed. Rather than viewing the black power movement as separate and divisive, the history of black power and self-determination is viewed as it intertwines with the history of civil rights activism. Although the course focuses on the post–World War II period, the class covers the roots of the movement in early twentieth-century struggles for justice. Same as HIS 171. (Fall)

175. Environment and Food Security in Africa. This course introduces key issues in the relationship between the environment and food security in Africa. Topics to be covered include population pressure, land alienation, cash-crop agriculture, new markets, and their impact on the ability of African farmers to manage their ecosystems. Same as HIS 175. (Spring)

185. African-American Religious History. Religion is an integral part of the lives and history of the peoples of the African Diaspora. Peoples of African descent in the Americas from the beginnings of slavery to the present have both embraced and contested religion, and it is this historic tension between African Americans' use and experience of religion as both oppressor and liberator that forms the foundation of the class. Same as REL 157. (Fall)

194Q. Rochester Politics and Places. Home to Frederick Douglass, Susan B. Anthony, and George Eastman, upstate New York has been the seedbed for many of the most important events in American history. In this seminar, students discover the rich history of Rochester as well as learn about current debates over political organization, racial and economic segregation, suburbanization, and economic change. The course emphasizes five major themes: urbanization and religious revivalism in the 1820s and 1830s; movements for abolition and women's rights; reform initiatives during the Progressive Era; economic and racial changes in the twentieth century; and city politics in the twentieth and twenty-first centuries. As part of the course, students visit sites in and around the city as well as meet and talk with political figures active in the city today. Same as PSC 225. (Fall)

202. The Third World. The concept of a Third World. The origins of colonialism and "underdevelopment" in the rise of European capitalism. The struggles of the colonial and postcolonial peoples for political independence, cultural autonomy and economic development. Same as HIS 201. (Spring)

210. American Culture. At the heart of this course is the question: What are some of the critical debates that dominate American culture? The course focuses on major debates that occupy American public life in areas such as politics, religion, health, and the media. Using anthropology's cross-cultural perspective, the course explores some core cultural principles that underlie current debates in various spheres of public life. Same as ANT 245. (Spring)

216. Topics in African and African-American Life and Culture. The primary goal of this course is to provide an introduction to the interdisciplinary approach to the study of issues in African and African-American life and culture. Students attend talks given by visiting speakers, meet, discuss, and respond to issues raised. (Fall and Spring)

220. Social Movements in the United States. This course surveys social movements in the United States mostly from the twentieth century, including Populist, labor, civil rights, and women's movements. Same as PSC 220.

221. Birth and Death I: Vital Events in Our Personal Lives. How do human beings experience, make sense of, cope with, and shape birth and death in their own lives and in the lives of those who are close to them? Historical and contemporary examples from North America, Latin America, Europe, the Middle East, Africa, and Asia. Same as ANT 218. (Fall)

222. African-American Autobiography. The genre of autobiography has served as the foundation of the tradition of African-American literature. It also illustrates and represents the discursive construction of identity. This course surveys the tradition of autobiographical writings by African-Americans, from slave narratives to recent bestsellers. It promotes an understanding of autobiography as a narrative form shaped by its historical context, by the
filtering process of memory, and according to the aesthetic, political, and personal purposes of the author. Featured authors include Maya Angelou, Frederick Douglass, Olaudah Equiano, Zora Neale Hurston, Harriet Jacobs, Barack Obama, Audre Lorde, Booker T. Washington, Richard Wright, and Malcolm X. Requirements include weekly one-page papers, two formal writing assignments, an in-class presentation, and class participation.

224. African-American Politics. This course surveys the political strategies adopted by African-Americans since Reconstruction to forge organized resistance to racial domination in the United States. Same as PSC 224. (Fall)

225. Race and Political Representation. The course introduces democratic theory, the civil rights movement, the voting rights act, African-American public opinion and electoral behavior, and the effect of electoral rules and districting decisions on representation. Same as PSC 225.

226. Black Paris. This course is a study of black Paris, as imagined by three generations of black cultural producers from the United States, the Caribbean, and Africa. Paris was a place of personal and artistic freedom that African-American writers, soldiers, and artists were denied back home. For colonized Africans and Caribbeans, Paris was the birthplace of the Negritude, the ultimate cultural renaissance influenced by the Harlem Renaissance. From Josephine Baker, Richard Wright, James Baldwin to Shay Youngblood's *Black Girl in Paris*, from Aimé Césaire to Maryse Condé, from Bernard Dadie's *An African in Paris*, and to contemporary Franco African writing, we investigate how the representation of Paris functions in the construction of black identities. Readings include *Black Girl in Paris* (Shay Youngblood), Desirada (Maryse Conde), *The Josephine Baker Story*, *Paris Noir*:
African Americans in the City of Light
(Tyler Stovall), and *An African in Paris*
(Bernard Dadie). Same as FR 247. (Spring)

228. Martin and Malcolm in America: Religion in the Civil Rights Movement. Martin Luther King Jr. and Malcolm X are icons of the civil rights movement, in part because of their religious beliefs and their deployment of belief in advocating for civil rights for African Americans. This course explores the religious biographies of MLK and Malcolm X, placing their lives in comparison to the broader civil rights movement and the roots of religious motivation and dissent that fueled the ferment of change. Same as REL 226. (Fall)

229. Contemporary Black Women
Writers. In recent decades some of the most powerful and innovative American literature has emerged from black women. This course focuses on the social and political contexts of Civil Rights, the Black Power movement, and debates about feminism to ground readings of such authors as Gayl Jones, Toni Morrison, Angela Davis, and Ntozake Shange.
ééSpecial attention is paid to the dynamics between black men and women, the balance between self-fulfillment and family responsibilities, modes of resistance, and the emotional legacies of slavery. Students are expected to be active participants in this discussion-based seminar. Same as ENG 230. (Spring)

232. Populations and Resources: A Twenty-First-Century Country Study. The relationship between a country's economy, natural resources, and social factors are studied. Students select individual sectors to research and work with a simulation model to predict conditions in the country to the year 2050, and assess policy options. (Fall)

236. Introduction to Francophone
Literature. This course surveys Francophone African and Caribbean literature from its beginnings in the '40s to the postcolonial age. We study major trends and texts that have shaped the emergence of a genuine Francophone literary tradition. Same as FR 271. (Fall)

241. Studies in a Major Author: Toni Morrison and Critical Theory. Toni Morrison has emerged as one of the most influential writers and critics in contemporary American culture. This course approaches her work from a broad range of critical perspectives

including black feminist thought, psychoanalysis, trauma theory, Biblical exegesis, postcolonial analysis, and critical race theory. Although this class emphasizes rigorous study of her literary work, close attention is also paid to her contributions to literary criticism and her role in public life as well as her forays into political and national debates. Same as ENG 243. (Spring)

243. Muhammad and the Qur'an.
This course is a study of the prophet Muhammad, the Qur'an, and their importance to medieval and modern Muslim culture. The prophet's life and major themes of the Qur'an are discussed together with interpretations of them found in Islamic legal, theological, philosophical, and mystical writings. Same as
REL 240W. (Fall)

245. African-American Drama. Surveys the entire tradition of African-American drama, including works by James Baldwin, Lorraine Hansberry, Suzan-Lori Parks, August Wilson, and many others. Same as ENG 247. (Spring)

246. Cry Freedom: Liberation Theologies of Africa and the Americas. This course examines various theologies of liberation including writers from South Africa, Latin America, and men and women from North America. Same as REL 234. (Fall)

247. Harlem Renaissance: Reflection and Refraction. This course provides a
survey of texts that reflect the spirit of the era, from writers such as Jessie Fauset, Langston Hughes, Zora Neale Hurston, Nella Larsen, Alain Locke, Claude McKay, Countee Cullen, and Jean Toomer. In addition, the course considers later works that are set in this milieu to ascertain what the Harlem renaissance has meant for later writers such as Samuel R. Delany and Toni Morrison.Special attention is paid to the subject of migration, constructions of black identity, and to the ways in which both sets of texts address differences within black America. Same as ENG 246. (Spring)

248. Marriage, Families, and Communities in a Global Perspective. In the twenty-first century and a new global economy what is the role of families and local communities in the United States and in other countries? Are families still seen as enduring/reassuring "building blocks"' of their respective societies? How does global labor migration of women and men affect families they leave behind and does it change local understandings of gender roles, family's communities? In this new global context how do people view attachment to "place"? Are there differences between the so-called "first" and "third world" and between rural and urban settings? Are there new forms of transnational marriage, love, families, and communities? Same as ANT 244. (Fall)

249. The Civil War. This course examines the events that led to the Civil War and the war's impact on the nation's political, social, and economic order. Same as HIS 249. (Fall)

250. Race in American Fiction. Starting with an introduction to critical race theory, this course examines representations of race in nineteenth- and twentieth-century American literature. Focus is on the relationship between racial constructions and the development of a national identity through a broad collection of works including novels, memoirs, scientific and legal documents, and films. Students explore the nature of racialized identity, the possibilities of passing and hybridity, definitions of citizenship, the relationship between class and race, and opposing constructions of whiteness and blackness. Authors studied include Herman Melville, Kate Chopin, James Weldon Johnson, William Faulkner, Zora Neale Hurston, Ralph Ellison, Toni Morrison, Richard Rodriguez, and Junot Diaz, among others. Same as ENG 250. (Fall)

251. U.S. Latinos/Latinas. This course introduces students to the emergent field of U.S. Latino/Latina writing and culture. Does the rich diversity of Latino communities in the United States—stretching from Los Angeles and the southwest to Miami and New York via Texas, Chicago, Minneapolis, and all stops in-between—frustrate or cancel any attempt to group their experiences under a single ethnic-racial term like "Latino/a"? What exactly is "the browning of the Midwest"? To what kind of gender, sexual, and racial codes are the inhabitants of these communities subjected? How do Latino/a narratives map the conflicted terrains of "utopias without borders," free-trade zones, diasporas, nomadic workforces, and even the Internet? Latinos, Latin Americans, immigrants, exiles, refugees, border peoples, rafters—it is increasingly as difficult to define the legal status of individuals and communities as it is to talk about social, economic, and cultural identities. Same as SP 282. (Spring)

252. Economies and Society of Latin America and the Caribbean Since 1492. Provides an historical explanation for the general problem of material poverty and the attendant sociopolitical crises that characterize contemporary Latin America and the Caribbean. Same as HIS 203. (Fall)

253. Economics and Social Conditions of African-Americans in the Twentieth Century. Study of selected topics concerning the conditions of African-Americans in the United States during the twentieth century. Topics include education, incomes, housing, family patterns, etc. Same as ECO 253. (Spring)

256. History of Race in America. This course identifies salient moments in the nation's history when race functioned as an organizing principle in the construction of American public and private institutions. Same as HIS 258. (Fall)

257. Lincoln and Douglass and Black Freedom. In what was probably the world's greatest century, marked by several national and international struggles for human freedom, two men stand head and shoulders above the many great men and women who participated in a civil war for American freedom: Abraham Lincoln and Frederick Douglass. At first glance, these two men had little in common; one born free on the American frontier, the other unfree in the heartland of slavery. Yet they had much in common; both largely self-educated, they both attained a mastery for words and the ability to communicate simply and directly with their fellow man. As if born to fight in one major battle for human freedom, these two men traveled diverse roads to meet on a momentous battlefield: black freedom and the future of America. Utilizing a wide range of sometimes opposing tactics, each in his own way

shaped nineteenth-century Americans' understanding of what it meant to be free and a citizen. Same as HIS 247. (Fall)

260. Africa's Sleeping Giant—Nigeria Since the Islamic Revolution of 1804. The course is taught in the context of the world economic order, its evolution from the sixteenth century and the location of different parts of the world within it. Nigeria, the most populous country in Africa, is blessed with vast mineral resources, which include petroleum, natural gas, coal, iron ore, and others. It has agricultural lands capable of producing a wide variety of tropical products and foodstuffs. Same as HIS 272. (Spring)

261. Islam in and out of Africa. Highlighting the importance of transnational Muslim networks in an increasingly globalized world, this course introduces students to both the anthropological study of Islam and the history and culture of Islam in Africa. Permission of instructor required for freshmen. Same as ANT 260. (Fall)

264. Representing Race in American Culture. In this course students confront and analyze a wide assortment of influential representations of race, especially, but not exclusively, representations of African-Americans drawn from the long history of this nation's racialized struggles. Examples are drawn not only from literature and film but also from history, sociology, and popular discourses. We consider the ways in which both black and white Americans have constructed representations of African and African-American identity in the U.S. public sphere, and the ways in which those representations have reflected and helped shape the problems and the promises of race in America. We also consider constructions of race in a global and comparative context. Same as ENG 264. (Spring)

265. Comparative Perspectives on Race, Culture, and Politics. Examines the formation of racial solidarity in the political sphere, state policies regarding racial inequality, and how race as a social construct operates as a political resource for racially dominated groups and for institutionalized political en-tities. The course covers the United States, South Africa, the United Kingdom, Brazil, and others. Same as PSC 265. (Fall)

271. Civil Rights in America. This course examines the civil rights movement in twentieth-century America, focusing on the post-1945 period. Following the call to view civil rights from a local perspective, the focus is a comparative study of the movement in a variety of locations: from the rural south to the urban north. In addition to examining the nonviolent struggle for integration in the South, activists' demands for better housing, jobs, and economic parity nationwide are reviewed. Rather than viewing the black power movement as a separate, and divisive, struggle the course intertwines the history of black power and self- determination with the history of civil rights activism. Although the course focuses on the post–World War II period, roots of the movement in early twentieth-century struggles for justice are also discussed. Same as HIS 271. (Fall)

277. Energy Resources and Utilization. Emphasis on technical and developmental aspects of energy resource problems; consideration of quality-of-life impacts of energy. Cross-listed with CHE 277. (Spring)

278. Birth and Death II. This course examines programs carried out by governments, multilateral organizations, and non-governmental organizations to deal with "public problems" connected to population: communicable diseases such as TB, malaria, and HIV/AIDS; famine prevention and relief; child survival, especially malnutrition and infant diarrheal disease; safe motherhood; teen pregnancy; contraception, and abortion. Same as ANT 278. (Spring)

280. Madness and Postcolonial Literature. This course explores inscriptions of madness in postcolonial African and Caribbean texts. Beyond the obvious and visible signs of what is generally termed "madness" (from the pathological to the political or cultural), we ask ourselves if the postcolonial arena cannot be interpreted as a pervasive manifestation of madness, that is to say, of something fundamentally "alien, foreign" to the Known, to the imperial destructuring order, and to the disarticulated colonial and post-independent communities. Same as FR 272. (Spring)

292. African Novel: Its Theory and Its Contexts. This course is a study of the Francophone African novel from north sub-Saharan Africa and from Madagascar. The course explores the political and cultural contexts that gave rise to modern African literature in general, and to the modern African novel in particular. Same as FR 278. (Fall)

297. Contemporary Issues in African-American Life and Culture. The course identifies and discusses a selection of texts considered crucial for the understanding of the black experience in America from 1619 to the present. Same as HIS 297. (Fall and Spring)

335. Major Literary Figure: James Baldwin. Heralded as one of the most prolific and versatile writers in American letters of the twentieth century, this course examines James Baldwin's writings. We read Baldwin within various theoretical and ideological frameworks including, but not limited to, Marxist, psychoanalytic, black feminist, queer, and Black Nationalism. Same as ENG 335K. (Spring)

343. Race and the American City. Race has played a major role in defining the physical, cultural, and political environment of American cities. This course explores the role of race in urban history in the nineteenth and twentieth centuries. Cities were utopian destinations for generations of immigrants and native-born African-Americans. Yet, those same cities were marked by racial prejudice, concentrations of poverty, and political corruption. The course examines these contradictions by analyzing the experiences of African-American, Latino, and Asian residents of urban centers. Same as HIS 343W. (Spring)

350. Criticism and Culture: Black Males and Culture. Surveys the literature (fiction, nonfiction, contemporary films) of and about African-American males. Begins with the slave narrative and the history of the slave culture, and explores the African-American male's historically racist, oppressive, and capitalist relationship to white America and his often sexist relationship with the African-American female. Same as ENG 350. (Spring)

351. Issues in Literature and History: African-American Feminists. In this course, students read and analyze primary texts—fiction and nonfiction—written by nineteenth- and early twentieth-century African-American women, who practiced and promoted feminist principles in their writings, speeches, art, theories, and social and political activism. Same as ENG 351. (Spring)

356. The Black Family in Slavery and Freedom. After a discussion of the Moynihan Report controversy and an assessment of the literature on the black family, the readings investigate why and how stable black families were encouraged and how they developed under slavery. The impact of factors such as economics, politics, religion, gender, medicine, and the proximity of free families on the structure of the black family are given special attention. In this way, the structure of the slave family on the eve of emancipation and its preparedness for freedom are tested and assessed. Students are encouraged to identify persistent links between the "history" of slavery and the black family and the development of social policy. Same as HIS 340. (Fall)

371. Evolution of the World Economic Order Since the Sixteenth Century.
Seminar course. Course deals with the economic relations between the developed and less developed parts of the world since the sixteenth century. Same as HIS 357W. (Spring)

372. America at War: The Civil War and Reconstruction. The course identifies and discusses causes, conduct, and consequences of the Civil War, and examines changing ideas about nation and nationalism, and perceived differences between northerners and southerners. Same as HIS 339. (Fall)

373. North Africa and the Middle East in the Age of Imperialism. The social, political, and economic consequences of the region's incorporation into the capitalist world economy from the early nineteenth century to the present. Analysis of major changes of the period highlights not only the logic of imperialism, but also the dynamics of the pre-existing sociopolitical and religious structures. Same as HIS 344W. (Spring)

375. The Atlantic Slave Trade and Africa, 1650–1850. Seminar course. Examines the level of socioeconomic development in Africa by the late fifteenth century, relative to the other major regions of the world at the time. The effects of the "production" of captives for export on social and political structures, and the overall economic consequences of the trade in Africa are also examined. Same as HIS 356W. (Fall)

380. Senior Seminar. Students draw upon their exposure to the theory methods of African and African-American studies to produce an interdisciplinary research paper on a topic of their own choosing.

INDEPENDENT STUDY AND RESEARCH

391. Independent Study: Hydrocarbon Energy for African Development. Independent studies on some aspect of the problems of energy resource development in
lower-income countries, solutions to it, and relationship to development issues, including work with the instructor's Access to Hydrocarbon Energy for African Development project, can be done within this course. Same as CHE 393.

393. Senior Project. May be an independent course with a faculty sponsor or may be taken in an advanced research seminar in which the student elects to write the essay but not to do all the required readings; as such it does not meet the 300-level seminar requirement, but it may be used as a distribution requirement within the area.

394. Internship in African and African-American Studies. Experience in an applied setting supervised on site. Approved and overseen by a University instructor.

ADDITIONAL COURSES

AAS 104. Contemporary Issues in Anthropology. Same as ANT 104. (Fall)
AAS 122. History of Jazz. Same as
MUR 122. (Spring)
AAS 133. Making the News: Euro-cen-trism and the Media. Same as ANT 207.-
AAS 150. Topics in Afro-Hispanic Litera-ture. Same as LIT 150. (Spring)
AAS 175. Between the Environment and Food Security in Africa. Same as HIS 175. (Fall)
AAS 210. American Culture. Same as ANT 245. (Spring)
AAS 215. Race and Gender in Afro-
Hispanic Literature. Same as SP 288/CLT 217. (Spring)
AAS 219. Special Problems in Applied Research Methodology. (Fall)
AAS 229. Slavery and the Twentieth-Century African-American Novel. (Spring)
AAS 230. Economics of Afro-American Slavery. Same as ECO 228. (Fall)
AAS 259. African-American Women's History. Same as HIS 259. (Fall)
AAS 264. Urban Economics: Prospects for Metropolitan America. Same as ECO 264. (Spring)
AAS 278. Islam and the Third World. Same as REL 247. (Fall)
AAS 287. History of the American South, 1792–1896. Same as HIS 253. (Fall)
AAS 288. History of the American South II. Same as HIS 254. (Spring)
AAS 335. Major Literary Figures: Toni Morrison. Same as ENG 335. (Spring)
AAS 349. Plantation Societies in the Americas. Same as HIS 337. (Spring)

AAS 354. State and Revolution in Southern Africa. Same as HIS 343. (Spring)
AAS 357. Oral History: Theory and Methods. Same as HIS 379.
AAS 365. Black Intellectuals. (Spring)
AAS 372. The Civil War: A Search for National Unity. Same as HIS 339. (Spring)
AAS 384. Food Crisis in Africa. Same as HIS 346. (Fall)

AMERICAN SIGN LANGUAGE

Elissa L. Newport, Ph.D. (Pennsylvania)
George Eastman Professor of Brain and Cognitive Sciences and Professor of Psychology
Ted Supalla, Ph.D. (California, San Diego) *Associate Professor of Brain and Cognitive Sciences and of Linguistics; Director of the Program*
Guillaume Chastel, M.A. (Gallaudet) *Senior Lecturer in American Sign Language*

Part-time faculty also teach several of the basic language courses.

The American Sign Language Program provides students the opportunity to develop an integrated base of liberal arts and sciences in the study of American Sign Language (ASL), the indigenous visual-gestural language developed and used by the Deaf community in most areas of North America. The program offers a major, minor, and clusters in American Sign Language.

LANGUAGE INSTRUCTION

The program offers five semesters of language instruction in ASL, which gives students sufficient facility in the use of ASL to converse with ease and to pursue advanced study of the structure of signed languages, and of deaf people, their history, cultural institutions, and literary achievements. Except where indicated, the advanced courses in the program require basic competence in ASL, as lectures and classroom discussions are conducted exclusively
in ASL without interpretation into spoken
English.

ADVANCED COURSES OF STUDY

The student is expected to meet a level of ASL fluency (by completing ASL 105 or 106 or with permission of the instructor) before taking any advanced course, except where indicated (e.g., ASL 200). Students can choose 200-level courses from a variety of areas. Literature courses examine literary forms of ASL of all kinds, from poetry to theater. Culture courses permit the student to understand and appreciate the heritage of deaf people in America. Language sciences courses provide further study of ASL itself—its production, history, and structure. The ASL Program thus offers a strong educational foundation for students interested in entering the field of deafness as sign language interpreters, instructors, counselors, government specialists, audiologists, speech pathologists, program administrators, community service personnel, and many other positions, or for entering advanced study in the cognitive and language sciences.

CLUSTERS FOR GENERAL EDUCATION REQUIREMENTS

Three clusters are available to students to meet general education requirements.

Humanities Cluster: Basic Proficiency in American Sign Language

- ASL 101. Beginning American Sign Language I
- ASL 102. Beginning American Sign Language II
- ASL 105. Intermediate American Sign Language I

Humanities Cluster: Advanced Proficiency in American Sign Language
Three from the following list:
- ASL 105. Intermediate American Sign Language I
- ASL 106. Intermediate American Sign Language II
- ASL 200. Sign Language Structure
- ASL 201. Introduction to ASL Literature
- ASL 203. Advanced American Sign Language
- ASL 205. Art of Translation: ASL and English

Social Sciences Cluster: Deaf Culture Studies
- ASL 201. Introduction to ASL Literature
- ASL 202. History and Culture of the Deaf Community
- ASL 250. Sociolinguistics of the Deaf Community

REQUIREMENTS FOR A CONCENTRATION IN ASL

Six Core Courses
- ASL 101. Beginning American Sign Language I
- ASL 102. Beginning American Sign Language II
- ASL 105. Intermediate American Sign Language I
- ASL 106. Intermediate American Sign Language II
- ASL 203. Advanced American Sign Language
- ASL 200. Signed Language Structure

Six Advanced Elective Courses
ASL concentrators are required to take two courses on literary and cultural aspects of ASL, two courses on linguistic and psycholinguistic aspects of ASL, and two additional courses from either of the two groups above, or from pedagogy and related topics.

REQUIREMENTS FOR A MINOR IN ASL

The minor in ASL requires six classes: three basic/intermediate-level language classes (ASL 101, 102, and 105), and three elective courses selected from the core and elective courses. The purpose of this minor sequence is to provide students with basic knowledge of the rich heritage of deaf people and their language and to enable students to think critically about what it means to be a member of the deaf community.

UPPER-LEVEL WRITING REQUIREMENT

ASL majors can satisfy the upper-level writing requirement by taking two of the following courses: ASL 200, ASL 201, ASL 220. These courses include substantial writing assignments where the instructor provides feedback allowing the student the opportunity to rewrite assignments.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

Note: To maintain signing skills, ASL students must continuously take classes in which the language of instruction is ASL: ASL 101–106, and the 200-level ASL classes (not including ASL 200, 208, and 260). To enter any of these classes, students must have taken a signing class in the immediately preceding semester or obtain permission of the instructor.

101. Beginning American Sign Language I. An introductory course in American Sign Language. Consists of a preparatory phase to attune students to communication in the manual-visual mode, followed by instruction and practice in vocabulary, sentence structure, elementary conversation, and literature. In addition, the course provides a survey of various issues raised by examining ASL and the Deaf community. Prerequisite: none (Fall and Spring)

102. Beginning American Sign Lan-gu-age II. Continuation of basic study of the language and culture of the American Deaf community. Prerequisite: ASL 101 in the immediately preceding semester or permission of the instructor. (Fall and Spring)

105. Intermediate American Sign Lan-gu-age I. This course emphasizes further development of receptive and expressive skills. Introduction to linguistic and cultural aspects of ASL poetry, art, and the theater. Prerequisite: ASL 102 in the immediately preceding semester or permission of the instructor. (Fall and Spring)

106. Intermediate American Sign Lan-gu-age II. Consists of advanced use of expressive and receptive skills in complex grammatical structures, dialogues, and storytelling. Prerequisite: ASL 105 in the immediately preceding semester or permission of the instructor. (Spring)

110. Comparative Study of French Sign Language. Intended for students with intermediate-level skills in ASL. American Sign Language is historically related to French Sign Language (LSF) and this course is designed for students who wish to pursue a comparative study between ASL and its parent language as well as to achieve independence in communication with French deaf people. The main objectives are to gain basic knowledge of modern LSF vocabulary and to examine archaic forms, thus enhancing understanding of sign language evolution and diversity.

200. Signed Language Structure. An examination of signed languages and the cognitive constraints that shape them, through a detailed consideration of the structure of American Sign Language and other natural languages of the world. Includes training in sign language notation and analysis. Intermediate signing skills required. Prerequisite: one of: ASL 105, LIN 210, 220, 226, BCS 152, or permission of the instructor. Same as LIN 230, BCS 264. (Spring)

201. Literature in American Sign Language. Study of selected videotapes and films ranging from the early 1900s to the present. Emphasis is placed on historical background, meanings of the story content, discussion of grammatical features, and styles revealed in these contexts. Prerequisite: ASL 106. (Fall)

202. History and Culture of the Deaf Community. Discussion of various aspects of the American Deaf culture, including descriptions of deafness and the Deaf community. Prerequisite: ASL 105. (Fall)

203. Advanced Sign Language. This advanced language course focuses on advanced ASL grammar, providing students practice in expression and comprehension skills in both conversational and formal registers. Hands-on exercises include the descriptions of complex and abstract concepts and advanced argumentation techniques. Prerequisite: ASL 106 in the immediately preceding semester or permission of the instructor. (Spring).

205. Art of Translation: ASL and English. Introduction to the study of meaning-based translation, with focus on the analysis of ASL texts and the development of written English translations. Prerequisite: ASL 201. (Spring)

208. Language Development. Basic introduction to children's language development including acquisition of phonology, syntax, and semantics. Focuses on the acquisition of a first language by young children and compares the acquisition of various spoken and signed languages to find possible universal principles of language learning. Students should have a background in at least one of the fields of study pertinent to course material: language structure, psycholinguistics, cognitive science, developmental psychology, or general psychology. No signing skills required. Prerequisite: one of BCS 110, 111, 172, PSY 101, or LIN 110. Same as LIN 208, BCS 259. (Every other Spring)

209. Teaching ASL as a Second Lan-guage. Provides ASL teachers with an understanding of how sign language is taught in various settings, and explores current teaching methods and theories. Students are provided opportunities to prepare lesson plans. Prerequisite: ASL 106. (Fall)

210. Narrative and Poetic Styles in ASL. Examines techniques for telling stories and creating poetry in ASL. Students have the opportunity to create literary forms from personal experience, as well as from well-known sources, with guidance from the instructor. Prerequisite: ASL 106. (Spring)

250. Sociolinguistics of the Deaf Community. Investigation of language attitudes, language policy, language use in society, and discourse analysis. Prerequisite: ASL 105. (Spring)

260. Language and Psycholinguistics. Overview of the nature and processing of human languages; comparisons between language and animal communication systems; consideration of biological bases of human language; discussion of the cognitive mechanisms used in producing, understanding, and learning language. No signing skills required. Prerequisite: BCS 110, 111, 112, or LIN 110. Same as LIN 217, PSY 152, BCS 152. (Fall)

280. Current Trends in Deaf-Related Careers. Bringing together historical information and career preparation strategies for teaching, service provision, and other related fields, this course is designed to provide an understanding of signed language as used in various settings and to explore professional service approaches to the Deaf community. The course also provides an overview of topics ranging from child language development to brain-cognition relationships, from educational interventions to technological advances, and social, psychological, and linguistic characteristics of Deaf communities and sign languages. (Fall)

290. Assessment and Diagnosis of ASL Competence. Examination of various diagnostic tools used for assessing sign language fluency. Guided fieldwork experience in ASL diagnosis with an emphasis on data gathering and analysis. Prerequisites: ASL 106 and 200. (Spring)

391. Independent Study of ASL.

ADDITIONAL COURSES
LIN 110. Introduction to Linguistic Analysis. (Spring and Fall)
BCS 162. Understanding Reading. (Fall)
BCS 172. Development of Mind and Brain. (Spring)
BCS 221. Audition. (Spring)

ANTHROPOLOGY

Anthony T. Carter, Ph.D. (Cambridge)
Professor of Anthropology
Robert Foster, Ph.D. (Chicago) *Professor of Anthropology and of Visual and Cultural Studies; Chair of the Department*
Thomas P. Gibson, Ph.D. (London School of Economics) *Professor of Anthropology*
Ayala Emmett, Ph.D. (Rochester) *Associate Professor of Anthropology*
Signithia Fordham, Ph.D. (American Uni-versity) *Associate Professor of Anthropology*
Ernestine McHugh, Ph.D. (University of California, San Diego) *Associate Professor of Humanities, Eastman School of Music and of Anthropology*
Eleana Kim, Ph.D. (New York University)
Assistant Professor of Anthropology
Daniel Reichman, Ph.D. (Cornell) *Assistant Professor of Anthropology*
Edward E. Calnek, Ph.D. (Chicago) *Professor Emeritus of Anthropology*
Grace Harris, Ph.D. (Cambridge) *Professor Emeritus of Anthropology and of Religion*
René Millon, Ph.D. (Columbia) *Professor Emeritus of Anthropology*
Walter Hinchman Sangree, Ph.D. (Chi-cago) *Professor Emeritus of Anthropology*

A teaching assistant occasionally helps with discussion sections in large courses.

Anthropology is the comparative study of humanity. At its broadest, it seeks to understand the origin and diversification of human adaptations to the natural and social environment. Thus physical anthropologists study the evolution of human anatomy and archeologists study the artifacts left behind by human manipulation of the natural world. But the most complex and diverse products of human activity are the languages, social relations, and cultural meanings humans have developed. It is these invisible artifacts that linguistic, cultural, and social anthropologists study. The Department of Anthropology at the University of Rochester specializes in this aspect of humanity: the comparative study of contemporary human cultures and societies.

The Department of Anthropology offers programs of study leading to the B.A. degree and to the B.A. degree with honors.

Students may minor in anthropology by following one of the two plans described below.

CONCENTRATION REQUIREMENTS IN ANTHROPOLOGY

Ten courses are required for a concentration in anthropology of which at least EIGHT must be at or above the 200 level. These 10 courses must include the following:

- ANT 101, Cultural Anthropology, normally taken BEFORE the spring semester of the sophomore year
- ANT 201, Theory and Method in Anthropology, normally taken in the spring of the freshman or sophomore years (ANT 101 will be a prerequisite beginning in 2010)
- At least two of the core courses in anthropology: ANT 202–205
- One course that fulfills the Senior Requirement:
  ANT 301–310, Advanced Topics
  ANT 390, Supervised Teaching (for ANT 101, Cultural Anthropology, only)
  ANT 393, Honors Research in Anthropology

THE HONORS PROGRAM

Students wishing to graduate with honors in anthropology must fulfill the normal requirements of the undergraduate concentration and must in addition:

- Successfully complete one additional core course and one other course at or above the 200 level

- Successfully complete ANT 393, Honors Research in Anthropology
- Submit an acceptable honors thesis by April 1 of the senior year to the thesis supervisor and a secondary reader in the department. Present the project at a colloquium open to all faculty and students in the Department of Anthropology

REQUIREMENTS FOR MINORS

Anthropology

Six courses in anthropology are required.

- ANT 101, Cultural Anthropology
- Two of the following courses in anthropology: ANT 201–205
- Three additional courses in anthropology, two of which must be at or above the 200 level

Medical Anthropology

Six courses are required.

- Two of the following courses in anthro-pology: ANT 201–205
- Three of the following courses in medical anthropology: ANT 101, 102, 216, 218, 220, 278
- Any one additional course in anthropology

UPPER-LEVEL WRITING REQUIREMENT

In addition to fieldwork, writing is central to the practice of social and cultural anthropology. Instructors give particular attention to techniques of analytical and persuasive writing in the core courses required of all majors. Students are provided opportunities across the anthropology curriculum to write fieldnotes, journals, exegetical essays, original ethnographies, and substantial research papers. Accordingly, the upper-level writing requirement is fulfilled by virtue of completing the requirements for the major in anthropology.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

INTRODUCTORY COURSES

These courses are usually open to first- and second-year students only.

101. Cultural Anthropology. The course is designed to give students an understanding of cultural variation and how anthropol-ogists interpret it.

102. Introduction to Medical Anthropology. An exploration of anthropological interpretation, research, and writing on the ways different peoples understand and deal with issues of illness and disease.

104. Contemporary Issues and Anthropology. A critical look at the anthropological approach to understanding social issues of homelessness, population growth, ecology, famine and food crises, refugees, health, human rights, social justice, and gender equity.

CORE COURSES IN ANTHROPOLOGY

201. Theory and Method in Anthropology. A survey of major developments in anthropological thought. Exploration of the relationship between sociocultural theory and the methodologies used by anthropologists to conduct ethnographic research such as participant observation (fieldwork), interviewing, and various writing strategies.
Prerequisite: ANT 101.

202. Modern Social Theory: Key Texts and Issues. A close textual analysis of three founders of modern social theory: Marx, Durkheim, and Weber, and of the use made of their works by contemporary social scientists.

203. Ritual, Myth, and Scripture. A survey of the major anthropological approaches to the study of the symbolic knowledge embedded in life-cycle rituals, origin myths, and religious scriptures.

204. Ethnographic Themes. Critical study of the role ethnographic texts play in posing and answering questions about human culture and society. This study may take the form of intensive readings on a particular society or area, or an extensive survey of ethnographic “classics” and their critics.

205. Theories and Debates in Anthropology. Contemporary and historical debates which have shaped theory and method in cultural anthropology, showing how they have shifted over time and differed between national traditions.

SENIOR REQUIREMENT COURSES

These courses are primarily for anthropology majors in their junior and senior years.

301–310. Advanced Topics. Prerequisite: ANT 201.

390. Supervised Teaching. For ANT 101, Cultural Anthropology. *By application only. The TA program requires students to work in teams and to lead group discussion.*

393. Honors Research in Anthropology.

INDIVIDUALIZED STUDY OPTIONS

390. Supervised Teaching.
391. Independent Study
392. Practicum in Anthropology.
393. Honors Research in Anthropology
394. Internship. Internships will be graded on a pass/fail basis only.

TOPICS IN ANTHROPOLOGY

110. Introduction to Linguistic Analysis. This course investigates the structure of human language, covering the basic techniques and concepts in the subfields of contemporary linguistic analysis. Same as LIN 110.
118. From Home to Abroad. This non-major course structures and connects a study abroad experience with the academic framework of study at home. Study abroad and cultural exchange programs provide university students with transformative experiences in foreign cultures.
213. World Musics. Examination of the world's musical cultures with an emphasis on musical repertories and how they fit within specific social and cultural context. Same as MHS 281.
214. Love, Friendship, and Community. Introduces students to a neurosociological perspective on strong interaction and strong personal ties—high-frequency social dynamics marked by strong mutual coupling. Same as SOC 221.
215. Self, Soul, and Psyche. What does it mean to be an individual? Examination of the shaping of experience in culture.
216. Medical Anthropology. The study of "disease" and "illness" in relation to society and culture. Comparative analysis of bio- and ethno-medical models. Prerequisite: one course from among ANT 101–104.
218. Birth and Death I: Vital Events in Our Personal Lives. Analysis of the interaction of population processes, sociocultural systems, and human welfare. Implications for population and health policy and for development are examined.
220. Healing and Ritual. Examination of the symbolic dimensions of healing by looking at the use of ritual procedures as a form of healing.
224. Anthropology and Development. Introduction to major trends in the anthropological study of international development through ethnographic case studies from around the world.
225. The Social Uses of Media: Anthropological Perspectives on Media in Global and Local Contexts. Introduction to the study of media from an anthropological perspective. Examination of the construction of media as objects of social scientific analysis, as both textual artifacts and social practice.
226. Culture and Consumption. Anthropological approaches to the study of mass consumption and material culture in Western and non-Western societies.
227. Local and Global Market Research. Introduction to the uses of cultural anthropology in a business environment; focusing on the retail experience of business owners and consumers in Rochester communities as well as factors influencing behavior from the wider political economy.
228. Women, Cloth, and Culture. An inquiry into women's predominant roles as textile artists, particularly in the Americas. Same as AH 259.
229. War and Migration. Critical examination of post-1945 migrations to the United States. Consideration of the far-ranging impacts of American military intervention in East and Southeast Asia on migration flows and the civil rights of American citizens of Asian descent.
239. Latin American Immigration: Anthropology without Borders. How has migration from Latin America to the United States and Canada reshaped culture, society, and economy on both sides of the U.S./Mexico border? Uses contemporary experiences of Latin American migrants to explore globalization, transnationalism, and international justice.
243. Ritual and Cosmology: Pacific Islands. Explores the cosmological visions and ritual processes of different Pacific Islands societies. Topics include myth, magic, sorcery, rites of passage, cargo cults, Christian missionization, and millennial anxieties.
244. Families, Marriage, and Communities in a Global Perspective. Explorations of current issues facing American families as expressions of contemporary change, cultural diversity, ethnic heritage, and core American values.
245. American Culture. American public debates on topics such as politics, religion, education, health, and popular culture are at the center of this course. Anthropology's cross-cultural research brings a global perspective to our local American debates.
248. Colonial and Contemporary Africa. An exploration of the impact of capitalism on African socioeconomic institutions during and after the era of formal colonialism. Same as HIS 106.
249. Envisioning Shangri La. Examines representations of Tibet and the Him-alayas in the West through film, memoir, and ethnography.
251. The Asian-American Experience. The history of Asian immigrants and Asian-Americans in the United States and Hawaii in the nineteenth and twentieth centuries. Same as HIS 280.
252. Women in East Asia. A history of women in the family, women and work, and women in society in three East Asian cultures. Same as HIS 296.
253. Imagining India. An introduction to India through the different perspectives of ethnographies, novels, and autobiographies

written by both indigenous South Asian and foreign authors. Same as ANR 230.
262. New Nationalisms. Taking the post-Communist 1990s as a point of departure, this course explores the roots and fates of different varieties of nationalism in Eastern Europe. Same as PSC 251.
263. Religion and Society. An exploration of rituals and doctrines in selected scriptural and nonscriptural religions in relation to their social-historical context. Same as REL 295.
264. Islam and Global Politics. A study of the conflict between Muslim Asia and Christian Europe, from colonial times to contemporary American foreign policy.
265. Religion and Culture: Fundamentalism. Looking deeply into the phenomenon of fundamentalism by concentrating on two prominent fundamentalist movements, Islam and Christianity, growing out of very different social and cultural worlds. Same as ANR 260.
266. Global Culture. This course brings an anthropological awareness of local cultural differences to bear upon the conception of a single capitalist world system, examining social processes that accelerate the circulation of ideas, people, and objects across the globe at unprecedented velocity: mass media, tourism, migration, and so forth.
274. Creative Ethnography. Experiment in different styles of telling a cultural story in one of the following ways: fiction, poetry, autobiography, creative nonfiction, photography, play, or the more traditional ethnographic writing.
276. Native American Gender and Representation in Art. An examination of quiltwork, beadwork, pottery, weaving, and other arts, both historical and contemporary made by indigenous women. Same as AH 276.
277. The Museum and "the Other." An analysis of the history and development of ideas about non-Western peoples as presented in North American museums from 1880 to the present. Same as AH 277.
278. Birth and Death II: Making Populations Healthy. Examination of programs carried out by governments, multilateral organizations, and nongovernmental organizations to deal with "public problems" connected to population.
299. Malawi Immersion Seminar. Students participate in an in-depth study experience in Malawi, Africa. The seminar analyzes issues of underdevelopment in Malawi in relation to culture, gender, public health, education, public policy, history, and religion.
351. Mind and Emotion in Culture. Questions about the construction of meaning in human life, with special attention to the use of cognitive theory.

ARCHAEOLOGY, ENGINEERING, AND ARCHITECTURE

The program aims to apply engineering methodologies as well as architectural, archaeological, historical, and anthropological approaches to investigate the establishment and evolution of technological practices and their relationship to ancient and pre-industrial societies and cultures. Emphasis is placed on undergraduate research under the aegis of both the University of Rochester and foreign academic institutions to address the interpretation, conservation, and restoration of the World Cultural Heritage. A distinctive feature of the program is study-on-location courses and internships, to be conducted both in Rochester and abroad as semester-long programs or intensive summer courses.

STEERING COMMITTEE FOR ARCHAEOLOGY, ENGINEERING, AND ARCHITECTURE

Theodore M. Brown, Ph.D. (Princeton)
Professor of History, of Community and Preventive Medicine, and of Medical Humanities
Elizabeth Colantoni, Ph.D. (Michigan)
Assistant Professor of Classics
Th. Emil Homerin, Ph.D. (Chicago)
Professor of Religion
John Lambropoulos, Ph.D. (Harvard)
Professor of Mechanical Engineering and of Materials Science, and Senior Scientist in the Laboratory for Laser Energetics; Director of the Materials Science Program; Chair, Department of Mechanical Engineering
Renato Perucchio, Ph.D. (Cornell) *Professor of Mechanical Engineering and of Biomedical Engineering; Program Director and Chair of Committeee*
Allen Topolski, M.F.A. (Pennsylvania State)
Associate Professor of Art; Chair, Department of Art and Art History

REQUIREMENTS FOR THE MAJOR

The major, which has been approved by the Faculty Council and will be submitted to the N.Y.S. Department of Education, consists of a minimum of nine courses (three foundation courses, three core courses, and three electives) and a senior thesis (8-credit-hour minimum). The three foundation courses are mandatory and must be completed by the end of the fifth semester. At least two of the three mandatory core courses must be selected from the same core. The remaining three courses may be selected from either the elective courses or the core courses. The senior thesis must be decided before the end of the sixth semester. Students have a regular faculty advisor assigned to help them plan and complete their programs. The choice of advisor is based on student interest and is made in consultation with the Program Director. The major may be constructed to satisfy an area requirement in any of the three divisions (Humanities, Social Sciences, Natural Sciences/Mathematics/Engineering) and is worked out with the faculty advisor at the time the student is admitted into the major. Students satisfy the upper-level writing requirement by writing the senior thesis.

TRACKS FOR THE MAJOR

- Archaeology/Art History/Classics/History
- Architecture
- Engineering

Foundation Courses

AH 107. Ancient Architecture
CLA 220. Classical Archaeology: Greek Art and Archaeology
or
CLA 221. Classical Archaeology: Roman Art and Archaeology
ME 106. Engineering in Antiquity

Core Courses

CORE 1—ENGINEERING
CLA 204. Engineering and Society in Classical Antiquity
ME 107. Mechanics and Optics in Antiquity
ME 206. Building Engineering and Technology in Antiquity
ME 207. Roman Structures: Building the Imperial City

CORE 2—ARCHAEOLOGY AND ARCHITECTURE

AH 106. Introduction to Archaeology
AH 114. Creating Architecture
AH 150. Introduction to Architecture
AH 243 Architecture of the Classical World
AH 245. Architecture in the High Middle Ages: Structure and Meaning
CLA (TBD). Etruscan Archaeology
CLA (TBD). Roman Archaeology in Arezzo
CLA (TBD). Topography of Ancient Rome
HIS 224. Archaeology of Comparative Colonization
HIS 269. Archaeology of Early America

CORE 3—HISTORY

AH 224. Arezzo (Italy): Renaissance and Social Changes in Italy
CLA 102. Cultural History of Ancient Greece
CLA 210. Roman World
CLA 205. The Society of Imperial Rome
CLA 214. The Ancient City
HIS 100. The Ancient World
HIS 101. Early Europe
HIS 102. The West and the World since 1492
PHL 201. History of Ancient Philosophy

CORE 4—SCIENCE, TECHNOLOGY, AND SOCIETY

HIS 111. History of Technology

HIS 207. Intellectual History of Science
IT 276. Arezzo (Italy): Technology, Science, and Society in Italy
MTH 300. History of Mathematics

Elective Courses
ENGINEERING
ME 110. Engineering Graphics
ME 120. Engineering Mechanics: Statics
ME 121. Engineering Mechanics: Dynamics
ME 204. Mechanical Design
ME 225. Introduction to Fluid Mechanics
ME 226. Introduction to Solid Mechanics
ME 254. Finite Elements

ART AND ART HISTORY
AH 137. Introduction to Modern Architecture
AH 256. Vernacular Architecture in the USA
AH 274. Cultural History of American Architecture
AH 284. Modern Architecture and Urbanism
AH 320. The Politics of Space
SA 111. Introductory Drawing
SA 131. Introductory 3D
SA 232. Advanced 3D
SA 233. Issues in Advanced 3D: Space Making

SCIENCE, TECHNOLOGY, AND SOCIETY
CHE/AAS 277. Energy Resources and Utilization
EES 119.Energy and Mineral Resources
EES 204.Mineralogy
EES 211.Earthquake and Volcanic Hazards: Living on an Active Planet

CLASSICS
CGR 101. Classical Greek I
CGR 102. Classical Greek II
CGR 103. Intermediate Greek
CGR 104. Intermediate Greek II
CLA 135. Classical Mythology
CLA 142. The Ideas of the Greeks
LAT 101. Elementary Latin I
LAT 102. Elementary Latin II
LAT 103. Intermediate Latin
LAT 213. Imperial Rome
LAT 216. Roman Historians

REQUIREMENTS FOR THE MINOR
The minor consists of five courses (two foundation courses, two core courses, and one elective) and an independent study or project (4-credit-hour minimum). The two foundation courses consist of ME 106 (Engineering in Antiquity) and either CLA 220/221 (Classical Archaeology) or AH 107 (Ancient Architecture). The two core courses need not be selected from the same core. The remaining course may be selected from either the elective or the core courses. The independent study or project must be decided before the end of the sixth semester. Students' assigned faculty advisors help plan and will supervise the independent study or project.

ART AND ART HISTORY

Janet Catherine Berlo, Ph.D. (Yale) *Professor of Art History and of Visual and Cultural Studies*
Douglas Crimp, Ph.D. (City University of New York) *Fanny Knapp Allen Professor of Art History and Professor of Visual and Cultural Studies*
Paul Duro, Ph.D. (Essex, England) *Professor of Art History and of Visual and Cultural Studies*
David A. Walsh, Ph.D. (Minnesota) *Professor of Art History and of History*
Elizabeth Cohen, M.F.A. (Rhode Island School of Design) *Associate Professor of Art*
Rachel Haidu, Ph.D. (Columbia) *Associate Professor of Art History and of Visual and Cultural Studies*
Joan Saab, Ph.D. (N.Y.U.) *Associate Professor of Art History and of Visual and Cultural Studies; Director, Program in Visual and Cultural Studies*
Grace Seiberling, Ph.D. (Yale) *Associate Professor of Art History*
Marni B. Shindelman, M.F.A (University of Florida) *Associate Professor of Art*
Allen Topolski, M.F.A. (Pennsylvania State)
Associate Professor of Art; Chair of the Department
Carl Chiarenza, Ph.D. (Harvard) *Fanny Knapp Allen Professor Emeritus of Art History*
Archibald Miller, M.F.A. (Cranbrook Academy)
Professor Emeritus of Art
Michael Venezia, M.F.A. (Michigan) *Professor Emeritus of Art*

The Department of Art and Art History offers courses in art history and studio arts, which may lead to a B.A. degree with a concentration in either of these areas. With a curricular plan and ongoing consultation with a departmental advisor, a student may petition for an individualized major that combines both. Each program provides a basis for graduate study and professional training for those students who wish to pursue careers in the arts, and a sound liberal education for those students whose final degree will be the Bachelor of Arts. Students' programs may be enriched by undergraduate/graduate courses in the department's graduate program in visual and cultural studies, which are based on the socio-his-tori-cal study of visual and literary texts with an emphasis on theory and criticism. The department also offers course clusters and minors in art history and studio arts. Students often complement a major in one area with a minor or cluster in another.

Registration in some courses is strictly limited and is by consent of the instructor. First-year students and sophomores will be considered first for admission to 100-level courses.

In-residence access to streamed media files and other recent technologies are among the many resources for learning available through the Multimedia Center, also located in the library.

The collections of the Memorial Art Gallery and George Eastman House are used in support of the programs of the department. In addition, a series of exhibitions is presented in the Art/Music Library Gallery and in the Hartnett Gallery at Wilson Commons, both on the River Campus. The department regularly sponsors visiting artists of note and lectures by distinguished outside speakers.

The Sage Art Center's spacious and open studio areas create an interactive surrounding conducive to broad-based learning; they include well-equipped studios for sculpture, painting, photography, drawing, printmaking, and video as well as digital and performance art. Sage is monitored by a studio art manager and a studio art program coordinator. A schedule of supplemental hours, monitored by studio assistants, provides ample opportunity for students to further their independent production in the facility. Faculty studios increase faculty accessibility and the AsIs Gallery presents ongoing and rotating exhibitions of art by students who are currently enrolled in courses in the studio program.

ART HISTORY AND VISUAL STUDIES

The information and methodologies of many fields come together in the Department of Art and Art History. The discipline of art history involves analysis of the work of art itself—understanding its form, and why and how we make use of it—and also investigation of its historical context and mode of production. These inquiries can lead in many different directions, involving economic, social, and gender issues; problems of patronage and taste; and questions of literary exchange, con-ser-vation, and restoration. The studies of visual and cultural documents and objects draw upon adjunct areas such as cultural and intellectual history, psychology, literary criticism, religion, philosophy, sociology, archaeology, and the history of science. The history of art is an ideal field for a student who wishes to acquire a general cultural background, to develop analytical and writing skills, and to sharpen critical sensi-

bilities.

General Course Information
The introductory courses cover broad historical periods and serve to introduce the methods and problems of art history. They are useful to both first-year and upperclass students who want a general overview. Sophomores, juniors, and seniors, as well as first-year students who have had a course in art history or some other relevant preparation, may begin at the 200 level, as well as the 100 level. The 200-level courses offer similar introductions but in much more defined areas. These are useful cognate courses for those students studying a specific period or culture in another discipline, and are also the building blocks for any major or minor within the department. Seminars are indicated by the 300 level and are open to advanced students from other disciplines as well as to art history majors.

CONCENTRATION IN ART HISTORY

For those who wish to concentrate in art history, the department offers a variety of approaches, structured around each student's individual interests and career plans. Students construct their studies with the aid and direction of the program advisor and typically follow one of three areas of concentration:

- Studio Theory and Practice
- Histories and Theories of Art
- Visual and Cultural Studies

These areas respond to the various ways students wish to explore art and visual culture, and provide flexible guidelines that allow students to combine courses from different departments into an individualized major within the Department of Art and Art History.

A total of 12 courses fulfill the requirements for a student majoring in art history/visual culture:

- Two or three 100-level introductory art history courses
- Four 200/400-level art history courses in a relationship determined in discussion with the program advisor. Independent Study in Art History and Internships can meet some of these requirements.
- One or two studio art courses
- One section of Writing on Art (offered once a year) in advance of the senior year
- One section of Senior Seminar in the senior year
- One additional course in the department

Study abroad during a fall or spring semester in the University's European Arts Internship program is encouraged for majors and non-majors alike. In Europe, there are opportunities to work in institutions, such as the Victoria and Albert Museum and the Museum of London, and internships can be arranged in Paris, Brussels, Bonn, and Madrid. In addition, the department offers an Art New York semester, which includes an internship and coursework as well as intensive exposure to art history/visual culture and contemporary art-making in New York City's museums, galleries, studios, and cultural institutions.

REQUIREMENTS FOR HONORS IN ART HISTORY

Students wishing to be considered candidates for honors in art history/visual culture must meet the following requirements *before* applying:

- Have a grade-point average of 3.3 within the major.
- Have completed the introductory courses and at least three courses in the students' program, or have demonstrated proficiency in a number of related courses in the field.
- Have completed a 300-level art history course or have otherwise demonstrated competence in the area of study of the proposed honors project.

To apply, submit to the department an honors project proposal that has been mutually agreed upon (signed) by the students and their chosen faculty advisors early in the junior year.

Following acceptance of the proposal by the department, the candidates must complete the requirements listed below:

- A minimum of 12 credit hours beyond concentration requirements: 4 credits in a 300-level seminar in art history; 4 in AH 393, senior project (the honors course); and 4 in a course given outside the art and art history department (e.g., in the history department) that is related to the honors project. The latter is intended to provide a broader or deeper understanding of the period or area of the honors project and normally will be a 200-level course selected in consultation with the honors faculty advisor and taken in the spring semester of the junior year or fall semester of the senior year.
- Completion of a distinguished essay, approximately 35 pages in length, which may be a seminar paper, further researched and suitably expanded, or it may be the direct product of AH 393 (Senior Project). In addition to the student's project advisor, a second reader, selected together by the advisor and the student, will evaluate the essay.
- Maintenance of a 3.3 GPA within the major.

- Submission of two complete copies of the essay, one of which will be preserved by the University.

MINOR IN ART HISTORY

The minor consists of five courses, three of which should be interrelated; these may be courses in a historical sequence, deal with a single period or medium, or address theoretical issues:

- Two or three 100-level courses
- Two or three 200/400-level courses

REQUIREMENTS FOR INDEPENDENT STUDY IN ART HISTORY

- Topic for research must not be available within the regular offerings of the depart-ment. Schedule conflicts are not a rationale for independent study.
- Faculty director must have relevant expertise in topic area and be willing to supervise the student and to sign a contract stipulating agreed-upon requirements.
- Normally open only to juniors and seniors.
- Semester must result in a completed re-search paper or equivalent project at an advanced level of achievement.

STUDIO ART

In Studio Art, housed at Sage Art Center, students find a multifaceted program that allows them to choose an area of concentration that is either medium-based or interdisciplinary. Both introductory and advanced-level courses operate within a regulated stu-dent/faculty ratio, enabling the personalized one-to-one interaction that is vital in art instruction. Students can select courses in drawing, painting, photography, sculpture, installation, video and sound art, digital imaging, performance art, and multimedia.

Introductory level courses focus on skill building, while providing students with a common vocabulary and artistic concepts needed to communicate ideas. Introductory courses usually explore interdisciplinary approaches within a particular medium, thereby expanding a stu-dent's scope of possibilities and providing him or her with alternative perspectives.

The advanced-level courses explore a wide array of approaches to artistic production while paying particular attention to individual-ized modes of investigation and learning within the creative arts. They foster an in-depth understanding of contemporary frame-works of art making and the critical discourses that address them. Advanced levels of studio courses are generally grouped together to promote peer-supported learning experiences. Students in levels "B" and "C" are expected to take on more challenging problems, both conceptually and technically. Individual work, progress, and effort are evaluated at respective levels. Many advanced-level courses include a seminar component that addresses issues in cultural and critical theory, as well as art history. In addition, the sophomore/junior seminar (Writing on Art) and the Senior Studio and Seminar (both -required of studio majors) focus primarily on these concerns. Thematically structured courses are also offered. In these courses a particular area of investigation becomes a locus for discussion and artistic production in a variety of materials and formats.

CONCENTRATION IN STUDIO ART

A concentration in studio art must be declared prior to the junior year and requires a total of 12 courses, including two from a re-lated area:

- Four 100-level studio art courses (prior to the junior year). No more than two transferred studio courses will be accepted toward a major.
- Three 200/300-level studio art courses
- One section of Writing on Art (offered once a year) in advance of the junior year
- Two semesters of Senior Studio and Seminar (taken in the final two semesters, the second of which should not be taken concur-rently with any other 200/300-level studio).
- Two other courses from related areas. Although these two courses are typically in art history/visual culture, one being from offerings in critical theory, relevant courses in film and media studies will also be accepted.

Students are encouraged to meet with a faculty advisor to design a coherent program of study early in their degree process. Majors should consider courses alternative to the regular 200/300-level offerings; internships, both local and through the Art New York program, as well as courses such as Supervised Teaching and study abroad are encouraged and available. The major is required to have an exhibition, installation, or screening of work in the final semester of the senior year; documentation of the work must be submitted and the student must be prepared to discuss the work in depth in a final review with the studio art faculty.

REQUIREMENTS FOR HONORS IN STUDIO ART

A student wishing to be considered a candidate for honors in studio art must meet the following requirements *before* applying:
- A grade-point average of 3.3 within the concentration.
- Completion of the established minimum distribution requirement for the concentration.

To apply, submit to the department an honors project proposal, the subject of which has been mutually agreed upon (signed) by the student and his or her chosen faculty advisor early in the junior year.

Following the acceptance of the proposal by the department, the candidate must fulfill the following requirements:
- A minimum of 12 credit hours *beyond concentration requirements* having the following distribution: 4 credit hours in a 300-level studio course; 4 credit hours in a 200-level or higher art history course, preferably in critical theory or an offering relevant to the student's artistic concerns, and agreed upon in consultation with a studio advisor; 4 credit hours in senior project (SA 393). The work involved in SA 393 should include both studio work and a distinguished essay of 8 to 15 pages soundly substantiating the student's art with historical and/or theoretical principles. SA 393 should be completed during the senior year and must be evaluated by the chosen faculty advisor and a second reader selected by mutual agreement.
- Submission of two complete copies of the essay and photographic documentation, one of which will be preserved by the University.

MINOR IN STUDIO ART

A minor in studio art requires five production-based courses:
- Two or three 100-level studio art courses
- Two or three 200/300-level studio art courses

Students are encouraged to meet with faculty advisors to design a coherent program of study early in their degree process.

REQUIREMENTS FOR INDEPENDENT STUDY IN STUDIO ART
- Topic for exploration must not be available within the regular offerings of the department.
- Faculty director must have relevant exper-tise in topic area and be willing to supervise the student and to sign a contract stipulating agreed-upon requirements.
- Normally open only to juniors and seniors who have previously completed a sufficient number of studio courses.
- Semester must result in a body of individual studio work or equivalent project at an advanced level of achievement.

Course schedule conflicts are not accepted as a rationale for independent studies.

REQUIREMENTS FOR GRADUATION WITH DISTINCTION IN THE DEPARTMENT OF ART AND ART HISTORY

Grade-point average is calculated only from the required concentration courses. Transfer grades and study abroad grades (unless given by the University of Rochester) are *not* computed. Levels of distinction are rated by minimum GPA as follows:

With Distinction	3.3
With High Distinction	3.5
With Highest Distinction	3.7

UPPER-LEVEL WRITING REQUIREMENT

Upper-level writing requirements for the department are available in the department office or by contacting one of the department undergraduate advisors.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

ART HISTORY (AH)

INTRODUCTORY COURSES

100. Introduction to Visual and Cultural Studies. An understanding of how visual media informs our everyday lives and experiences.

101. Introduction to Art History. Addresses visual culture from the Renaissance to the present and seeks out connections and themes within the whole period under consideration.

102. Introduction to Media Studies. Considers the cultural and economic histories of the mass media, with television produced in the United States as the primary focus with close consideration to questions of race, gender, and cultural identity in U.S. media culture. Same as ENG 131.

107. Ancient Architecture. This offering introduces architecture of the ancient world with a focus on Egypt, Mesopotamia, the Bronze Age Aegean, Greece, and Rome. Of particular interest is the creation and development of urbanism in which spaces and buildings are expressions of political, social, economic, and religious aspects of the cultures. Due consideration is made of the environment as a source not only of materials (and their construction techniques), but as relating to the meaning of buildings and the world view of the cultures.

128. Modern Art. An introduction to major modernist movements of nineteenth- and twentieth-century art, such as Impressionism, Post-Impressionism, Cubism, Surrealism, Abstract Expressionism, and Pop Art.

130. History of Photography. Historical survey of photography from its pre-history to the present day.

136. Introduction to the Art of Film. The primary visual, aural, and narrative structures and conventions by which motion pictures create and comment upon significant human experience. Same as ENG 132.

137. Introduction to Modern Architecture. Topics include major figures such as Richardson, Sullivan, Voysey, Wright, Corbusier, or Mies van der Rohe, and topics such as the architectural development of structural metal, Art Nouveau, urban spaces, or the Bauhaus.

PROGRAM COURSES

209. Writing on Art. Students analyze prose by artists, historians, cultural critics, and others who have written about art during the last 100 years and sharpen their own skills as writers about both historical and contemporary arts.

210. Woman as Image and Text. An examination of the female body as a visual and textual image through history.

214. Beyond the Boundaries: Folk, Outsider, and Visionary Arts. Examines the problematized categories of "folk" and "outsider" and other categories that fall outside the canon, considering historical works of the last 100 years, as well as contemporary arts and critical writings on both of these.

215. Contemporary Art: Theory and Practice. Designed to provide a forum for the discussion of artwork produced by students within the context of current art being shown in galleries and museums.

217. Art, Science, and Visual Representation. Investigates the many connections between art and science, such as Leonardo's scientific notebooks, Neo-Impressionist color theory, images of Enlightenment science and thought, the development of perspective, and scientific illustration.

238. Romanesque Europe. A study of the origins, development, and regional manifestations of western European art and architecture of the Romanesque period (eleventh and twelfth centuries A.D.).

239. Gothic Europe. Explores the intellectual, social, political, economic, and religious aspects of medieval culture of the twelfth and thirteenth centuries through its art and architecture.

242. Barbarian Europe. Explores the cultures of northern Europe from the fifth century B.C.E. to the tenth century C.E.

243. Architecture in the Classical World. The architecture of Greece and Rome is fundamental to our understanding of the heritage of the West. This course traces the origin and development of building types in Greece: the temple and its sacred area, buildings of public cultural use such as theaters, and the invention of town planning. The development of Roman architecture also is examined for its sources and meaning, considering local Italic traditions, Etruscan, and Greek. In addition to determining the meaning of architectural forms, two major themes are followed: the spatial aspect of planning and building and the inventiveness of Roman constructional practices.

245. Architecture in the High Middle Ages: Structure and Meaning. This course introduces the architecture of Western Europe from the eleventh to the fifteenth century. Building of this era is usually divided into two principal phases, Romanesque and Gothic. While there are numerous regional and chronological variations during these centuries, many instances of exchange across Europe and exotic influences through cross-cultural contact, the course stresses the pan-European development of structural and aesthetic inventiveness and the extraordinary relation between form and content in buildings, whether churches, monastic communities, houses, or castles. All of the works are examined against the changing values of cultures which constitute the transformation of the West.

250. Art and Culture. This course addresses the painting, sculpture, and architecture of seventeenth-century Europe and considers the art of the period as a manifestation of a post-Renaissance sensibility. The art examined ranges from Italian ecclesiastical sculpture through to French royal architecture and Dutch still-life painting.

255. American Art. Examines selected topics in American art and culture of the nineteenth and twentieth centuries. A central concern will be the way in which images, expecially paintings and photographs, gave shape to the ideas of what America was and what it meant to be American, as well as to the creation of an urban culture.

259. Women, Cloth, and Culture. An inquiry into women's predominant roles as textile artists, particularly in the Americas. Topics may include historical quilts and other
needlework; contemporary fiber arts; indigenous and ethnic traditions; and theoretical and feminist issues concerning women's roles as makers of "soft goods."

260. Cultural Tourism. Tourism is a phenomenon in which art, money, media, colonialism, and ideas about culture come together. From religious pilgrimages to study abroad or the contemporary urbanite's search for contact with exotic cultures, journeys to unfamiliar places have served many purposes. This seminar presents students with varied perspectives and methodologies through discussion of readings drawn from different fields, and considers tourism in the past, looking at phenomena such as medie-

val pilgrimages or the Grand Tour in the eighteenth century, and the present, such as the shaping of the Other in Western eyes or the implications of new media. Students' research projects connect subject matter drawn from their own interests with the idea of tourism, taken in its broadest sense.

262. Impressionism and Post-Impressionism. Deals with the interconnecting artistic concerns and subjects of artists such as Manet, Monet, Renoir, Pissaro, Morisot, Cassatt, Cezanne, Van Gogh, and Gauguin. Also investigates ways in which paintings and prints made during the nineteenth century in France in their representations of aspects of modern life such as the city and suburbs, leisure activities, and gender roles participated in communicating a particular world view.

263. Twentieth-Century Art and Culture. Explores selected aspects of twentieth-century art, including issues of identity, difference, and the body and ways in which institutions have shaped art.

266. African-American Visual Culture. This course surveys African-American visual culture (including painting, sculpture, photography, prints, textiles, mixed media, installations, performance, and video) in the United States from Colonial times to the present.

274. Cultural History of American Architecture. Focuses on what the critic Andreas Huyssen calls the perceived "Great Divide" between highbrow and lowbrow forms of culture. Explores the emergence of these divisions and interrogates if and how they have blurred in the recent past.

276. Gender and Representation in Native American Art. An examination of gender-based artistic practices in selected Native American societies.

277. The Museum and 'the Other.' An analysis of the history and development of ideas about non-Western peoples as presented in North American museums from 1880 to the present.

280. Native American Art and Religion. Case studies in Native American cultures where the visual arts articulate religious and philosophical systems of thought.

282. Topics in Contemporary Art and Criticism. Examines specific practices of art and architecture from the 1960s through the 1990s in relation to theories of postmodernism.

283. Contemporary French Film. Through close analysis of popular film, this course explores contemporary French culture as it reworks national identity. Focusing on changing definitions of "Frenchness" the course examines its articulations with shifting conceptions of tradition, of the popular, and of the nation. Readings include central cultural conflicts around identity and difference in the context of the emergent European economic community, as well as the specifically French context of "immigration" and "assimilation." Of particular interest is the comparative analysis of French and U.S. popular discourses on social issues involving sexuality and gender, race, ethnicity, and "multiculturalism." Films include works by Bertrand Blier, Luc Bresson, Andre Techine, Cyril Collard [SAVAGE NIGHTS], Mathieu Kassovitz, Claire Denis, François, Ahmed Bouchaala [KRIM], Karim Dridi [Bye-Bye] as well as recent works by such widely known auteurs as Claude Chabrol and Jean-Luc Godard.

287. Culture on Display. Most of us experience "real art" in museums. This course looks at the phenomenon of the museum, asking questions about the relation of culture and institutions.

ADVANCED COURSES

306. The Sublime in Visual Culture. Undertakes a re-evaluation of the perceived ideas associated with the operation of the pictorial sublime in European Romanticism and to extend its traditional boundaries to encompass Colonial, American, and Orientalist painting.

307. Rhetoric of the Frame: the Borders and Boundaries of Art. At first glance the frame of art may seem to be as unproblematic as it is marginal—a surround to protect the edges of a painting, a pedestal for a statue, an embellishment or ornament for what is already present—this course aims to show that the frame serves to create a space for the artwork that the work, in itself, is incapable of furnishing.

308. Art and Imitation: Visual Representation in the Western Tradition. Addresses the issue of imitation in art, focusing on the binary between the imitation of nature and that of the antique.

311. Dance, Art, and Film. This course explores relations among dance, art, and film at significant moments in the twentieth and twenty-first centuries. Instances in which the forms are particularly closely aligned include the famous productions by artists such as Gontcharova, Picasso, and Matisse, for Diaghilev's Ballets Russes; Martha Graham's partnership with Isamu Noguchi; and Merce Cunningham's work with Robert Rauschenberg. The course also looks at how dance is filmed or how dance uses film, concentrating on two figures of the postwar American avant-garde: Merce Cunningham and Yvonne Rainer.
Cunningham's dances choreographed for film in collaboration with film- and videomakers and Rainer's move from choreography to filmmaking and eventually to hybrids of the two constitute the core of the course.

313. Architecture/Photography, Modernism/Postmodernism. The subject of this course is inspired by a series of photographs commissioned from Hiroshi Sugimoto for the Los Angeles Museum of Contemporary Arts' exhibition At the End of the Century: One Hundred Years of Architecture. Sugimoto's photographs show canonical works of modern architecture shot out of focus, reduced to both icon and phantom. The seminar considers the changing relations between photography and architecture, between image and space, between picture and object from the advent of modernism to the present. The course looks at these relations in the

New Objectivity and the New Vision, Surrealism, the International Style, Mid-Century Modern, and ends by considering the uses of the photography of architecture in Conceptual art and the fascination with modernist architecture in contemporary photographic work. Students read critical studies of modernist architecture and photography and plot the relations between these discourses and practices.

320. The Politics of Space. Explores how space is constructed and politicized. Close attention is paid to questions of identity formation, particularly as they relate to issues of gender, race, and class.

350. Topics in Contemporary Art and Criticism. The focus changes from monographic (Andy Warhol) to a survey of postmodernism or art of the 1960s.

362. Seminar in Western Monasticism. Explores the variety of forms of monasticism in Western Europe during the Middle Ages.

368. Art of the Colonial Encounter.
Case studies in artistic production forged in the "middle ground" of a colonial situation, principally in the Americas, from 1520 to the present.

385. The Visual Culture of Heritage and Identity. Cultural critic Stuart Hall has observed that Heritage is a discursive practice. It is one of the ways in which the nation slowly constructs for itself a sort of collective social memory. This upper-level seminar looks at case studies of how people (through the collectivities of gender, ethnicity, race, or nation) construct visual narratives about the past. Among the topics for consideration are Holocaust memorials, Native American and Polynesian museums and cultural centers, African-American quilt histories, and even individual artists' projects of the last few decades (Judy Chicago, Fred Wilson, Silvia Gruner, José Bedia, and Jolene Rickard, among others). Students see how various constituencies have borrowed from what Arjun Appadurai has called a warehouse of cultural scenarios in order to construct a useable past that supplies what is needed in the present, irrespective of its relationship to the verifiable realities of the past. Readings are drawn principally from the disciplines of history, anthropology, cultural studies, and art criticism.

391. Independent Study in Art History. Independent study under faculty guidance of a limited field of art history or individual study on a single topic at an advanced level under the guidance of a member of the art history faculty.

392. Art New York Program. The program combines an internship with a colloquium and elective courses and is run each spring semester in New York City. It is offered to all qualified junior and senior students interested in learning about how art gets made, how it reaches its public, and the proc-ess of its interpretation and display. Students receive a total of 16 credits for their Art New York semester.

393. Honors Project. See "Requirements for Honors in Art History,'' page 26.

394. Internships. Internships in London and the United States.

STUDIO ART (SA)

INTRODUCTORY COURSES

111. Introductory Drawing. Explores basic principles of visual organization and investigates, at an elementary level, approaches to art production.

112. Concepts in Introductory Drawing. Addresses studio production as a visual component of the investigations into the exhibition institution, while taking up the readings and formal concerns relevant to the topic.

121. Introductory Painting. Emphasizes direct experience, practical processes, and compositional basics all in a framework of critical analysis.

122. Concepts in Introductory Painting: Ritual and Practice. Provides direct experience with painting and related processes at an introductory level while supplying a forum for examining how ritual and practice play into the creation of art.

131. Introductory 3D. Explores many approaches to three-dimensional art making, within a contemporary framework, and covers a wide range of materials and processes from metal and welding to assemblage, from wood to experimental methods and media.

132. Concepts in Introductory 3D: (Re)Collecting the Object. Provides a framework for introductory-level, three-dimensional studio production focusing on the incorporation of appropriated objects and found materials.

141. Introductory Photography. The goal of this course is to begin to formulate conceptual ideas and to gain the skills and techniques necessary to synthesize these ideas through photographic imagery.

142. Concepts in Introductory Photography: Materials and Processes. Introduces students to black-and-white photographic processes. Learned skills and the linear and nonlinear representation of ideas are addressed as well as nonsilver photographic processes.

144. Introductory Photography/Digital.

145. Concepts in Introductory Photography/Digital.

151. Introductory Digital Art. An introduction to the use of the computer as a tool of art production using various multimedia software.

152. Concepts in Introductory Digital Art.

161. Introductory Video and Sound Art. Video and sound are considered as independent art forms, as well as part of video in-

stallations and sound installations. This course covers both analogue and digital formats.

162. Concepts in Introductory Video and Sound Art.

171. Introductory 2D. Provides a framework for two-dimensional studio production; conventional experimental approaches and processes of drawing, painting, and photography; or drawing, collage, and digital image production are investigated, utilized, and interrelated.

172. Concepts in Introductory 2D.

190. Introductory Visual Production. Builds on areas of research interest connected to AH 100, Introduction to Visual and Cultural Studies. Addresses studio production as a visual component of these investigations, while taking up relevant readings and formal concerns.

191. Visual Display: The Exhibition as Artistic Medium. Introduces students to traditional and nontraditional artistic production and curatorial practice as emphasized by current exhibitions at institutions within the Rochester area.

PROGRAM COURSES

It is recommended that two 100-level studio courses and one course in art history be taken prior to or concurrently with a 200-level course.

In courses numbered 200 and higher, some research may be assigned; however, students are expected to develop their own projects. Individual and group discussions of student work, gallery visits, presentations by guest artists, slide talks, and readings are regular features of these courses. Classes are normally limited to 15 students.

222A, B, C. Advanced Painting. The evolving continuation of painting with serious emphasis on independent proposals, research, and production. The broadest examination of painting and related media is expected.

232A, B, C. Advanced 3D.

233A, B, C. Issues in Advanced 3D: Narrative and Anti-Narrative. Broadens the investigation undertaken in introductory 3D classes to include other materials and proc-esses as well as a focus on working in an interdisciplinary fashion.

242A, B, C. Advanced Photography. Looks at contemporary photography and photographic practice using readings, visiting collections, galleries, and production of photographic work.

243A, B, C. Issues in Advanced Photography: Race, Gender, Ethnicity. Examines the relationship between digital and traditional photographic processes and the ideas of contemporary race and gender theory.

244A, B, C. Advanced Photography/Digital.

245A, B, C. Issues in Advanced Photography/Digital: Image and Text. Image and text serve as a conceptual background for exploring advanced photographic and digital techniques. The course begins with basic photographic skills and moves into areas such as silkscreening, alternative photographic processes, and Adobe Illustrator.

252A, B, C. Advanced Digital Art II, III, and IV. Looks at contemporary digital art and new media and practice using readings, visiting collections, galleries, and production of photographic work.

253A, B, C. Issues in Advanced Digital Art.

262A, B, C. Advanced Video and Sound Art. In this advanced production course, video and sound are considered as independent art forms as well as part of video installations. Students produce experimental videos and sound pieces. They also explore the use of these mediums when combined with two- and three-dimensional materials in real time.

263A, B, C. Issues in Advanced Video and Sound Art: Memory and Documentary. Addresses studio production as a visual component of the investigations in memory and documentary, while taking up relevant readings and formal concerns.

272A, B, C. Advanced 2D.

273A, B, C. Issues in Advanced 2D: Series and Sequence. Emphasizes bookmaking as a physical structure for creating sequential imagery.

292A, B, C. Markings, Methods, and Materials. Explores the boundaries of conventional studio production through experimentation with nontraditional materials and invented approaches. Investigates the act of "making a mark" and probes the motives and impulses inherent in that process.

293A, B, C. Interdisciplinary Studio: Imagined Futures. Builds on areas of research interest connected to travel and tourism, extended notions of the body, and new configurations of space and community.

391. Independent Study in Studio Art. Individual studio work at an advanced level and under the guidance of a member of the studio arts faculty.

392. Art New York Program. See listing under Art History courses.

393. Senior Project. See "Requirements for Honors in Studio Art," page 27.

396–397. Senior Studio and Seminar. For senior majors and minors. Addresses contemporary issues in art through readings, discussions, and student presentations of cultural theory, art history, and art criticism. Consists of the intensive critique of ongoing work, critical writing, and the development of a thesis exhibition. (Fall and Spring)

ASIAN STUDIES

COMMITTEE ON ASIAN STUDIES

Douglas R. Brooks, Ph.D. (Harvard) *Professor of Religion and Chair of the Committee*
Anthony T. Carter, Ph.D. (Cambridge) *Professor of Anthropology*
Thomas P. Gibson, Ph.D. (London School of Economics) *Professor of Anthropology*
William B. Hauser, Ph.D. (Yale) *Professor of History*
David Pollack, Ph.D. (California, Berkeley) *Professor of Japanese and of Chinese*
Joanne Bernardi, Ph.D. (Columbia) *Associate Professor of Japanese*

The program uses teaching assistants in large lecture courses and language offerings.

ASIAN STUDIES
CERTIFICATE PROGRAM

The Asian Studies Certificate Program at the University of Rochester is designed to permit students concentrating in the social sciences and humanities to develop knowledge of Asian cultures and languages as a complement to their disciplinary concentration. Those interested in the program must satisfy the requirements in their major field and, in addition, submit a program that includes at least the following:

- Six courses from those listed under the heading "Primary Courses in Asian Studies,'' with an understanding that no more than two will be taken in any one department.
- Four additional courses from those listed under the heading of Modern Languages and Cultures (Chinese or Japanese), Religion and Classics (Sanskrit), or Allied Asian Courses.

In addition:

- None of the courses used toward the certificate may be taken satisfactory-fail.
- Students must earn an overall grade-point average of at least 2.0 in courses submitted for the program.

The Asian Studies Certificate Program is administered through the College Center for Academic Support. Students who plan to enroll in the program should pick up an application at the Academic Services Counter outside 312 Lattimore Hall and then consult one of the members of the Asian Studies Committee, who act as faculty advisors for the program. Once the application is filled out and is signed by the faculty advisor, it should be returned to the College Center for Academic Support.

Upon graduation, students successfully completing the Asian Studies Program receive a Certificate in Asian Studies.

PRIMARY COURSES
IN ASIAN STUDIES

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

ANTHROPOLOGY
ANT 215. Self, Psyche, and Soul.
ANT 253. Imagining India.
ANT 264. Islam and Global Politics.

MODERN LANGUAGES AND CULTURES—
Japanese and Chinese
Any offering between JPN 210 and JPN 293.
CHI 210. Introduction to Traditional Chinese Culture.
CHI 232. Asian Calligraphy: History and Practice.

HISTORY
HIS 105. Traditional Japan.
HIS 108. Traditional China.
HIS 183. Modern China.
HIS 184. Modern Japan.
HIS 238. History of British India.
HIS 280. The Asian American

Experience.
HIS 296. Women in East Asia.
HIS 314W. Gender and International Human Rights.
HIS 347. Tokugawa Japan, 1560–1850.
HIS 348. Modern Japan, 1850–1945.
HIS 349. Postwar Japan.
HIS 387W. Nation and Culture in Twentieth-Century China.
HIS 388W. The Chinese Cultural Revolution in History and Memory.
HIS 389W. Gender in Late Imperial and Modern China.

RELIGION AND CLASSICS
REL 105. The Asian Search for Self.
REL 106. From Confucius to Zen.
REL 108. Hinduism: An Introduction.
REL 171. Storytelling in Indian Religions.
REL 172. Striving for Perfection.
REL 173. Religions of Japan.
REL 255. Hindu Goddesses and Women.
REL 257. Hindu Philosophy I.
REL 258. Hindu Philosphy II.
REL 259. Hindu Mystical Poetry.
REL 260. Hindu Ascetics, Mystics, and Doctors.
REL 261. Hindu Tantric Yoga.
REL 263. Japanese Noh Drama.
REL 264. Buddhism in South Asia.
REL 266. Buddhist Philosophers, Poets, & Siddhas.
REL 270. Medicine, Alchemy & Religion in India.
REL 271. Medieval Hindu Philosophy.
REL 272. Classical Yoga Traditions of India.
REL 310. Seminar in Mahabharata.

MODERN LANGUAGES AND CULTURE, RELIGION AND CLASSICS (LANGUAGES)
Any offering from Modern Languages and Cultures (Chinese and Japanese) or Religion and Classics (Sanskrit)

ALLIED ASIAN COURSES

ANTHROPOLOGY
ANT 266. Global Culture.

HISTORY
HIS 201. The Third World.

ASTRONOMY
(see Physics and Astronomy, page 105)

UNDERGRADUATE
PROGRAM IN BIOLOGY
AND MEDICINE

COMMITTEE OF
TRACK COORDINATORS

Robert E. Marquis, Ph.D. (Michigan) *Professor of Microbiology & Immunology; Microbiology Track Coordinator*
Ernest J. Nordeen, Ph.D. (California, Irvine)*Professor of Brain and Cognitive Sciences, of Psychology, and of Neurobiology and Anatomy; Neuroscience Track Coordinator*
James D. Fry, Ph.D. (University of Michigan)*Associate Professor of Biology; Evolutionary Biology and Ecology Track Coordinator*
Elizabeth Grayhack, Ph.D. (Cornell)
Associate Professor of Biochemistry and Biophysics; Biochemistry Track Coordinator
Elaine Sia, Ph.D. (Columbia) *Associate Professor of Biology; Molecular Genetics Track Coordinator*
J. David Lambert, Ph.D. (University of Arizona)*Assistant Professor of Biology; Cell and Developmental Biology Track Coordinator*
Anthony J. Olek, Ph.D. (SUNY, Albany) *Senior Lecturer in Biology; B.A. in Biology Track Coordinator*

Undergraduate education in the biological sciences at the University of Rochester involves an unusually close collaboration between the arts and sciences and the School of Medicine and Dentistry.

Undergraduates may choose to obtain either a B.A. degree in biology or a B.S. degree in biological sciences with specialization in one of six areas: biochemistry, cell and developmental biology, evolutionary biology and ecology, microbiology, molecular genetics, or neuroscience. In addition, students may receive a Certificate in Biotechnology in con-junction with a degree upon completion of a prescribed set of courses.

Each of the curricula described below constitutes strong preparation for graduate or professional study. The combined curricula of the Undergraduate Program in Biology and Medicine offer more than 56 lecture and laboratory courses and additional seminars in specialized topics. In addition to formal coursework, the large number of faculty involved in the program provides an exceptional number and diversity of independent research opportunities.

PLANNING A CURRICULUM

One particular advantage of the program is that the student need not make a premature choice between the degrees offered. The B.A. and B.S. degrees require a common core of courses: BIO 110 and 111/111L or BIO 112 and 113/113L, Principles of Biology I and II or Perspectives of Biology I and II; and BIO 198, Principles of Genetics. These core courses are to be taken in sequence. The student may then sample several gateway courses in the specific areas of the six B.S. curricula; these courses may be used as part of a B.S. program (as required or as diversification courses) or may become part of a B.A. curriculum. In addition, most of the courses required in the allied fields (chemistry, mathematics, and physics) are the same for both of the degrees offered. Students interested in pursuing a concentration in biological sciences are urged to begin fulfilling the chemistry requirements in the first year. A typical program for the first two years that would prepare a student for a B.A. degree is listed below. Students seeking a B.S. degree would take the same first-year sequence of courses, but the coursework taken in the second year might differ somewhat.

First Year

Fall	*Spring*
BIO 110 or 112	BIO 111/111L
	or
CHM 131	BIO 113/113L
MTH 141/161, or 161Q	CHM 132
English	MTH 142,162,
	or 162Q
	Elective

Second Year

Fall	*Spring*
BIO 198 and 198L	BIO 250
CHM 203/207 lab	CHM 204/208 lab
or	*or*
CHM 171Q/173Q lab	CHM 172Q/210 lab
Elective	Elective

Elective Elective

B.A. in Biology
The B.A. curriculum is intended to provide the student with a well-rounded introduction to the major areas of biology. This program offers the maximum freedom of course selection since among the eight biology courses (minimum 32 credits) necessary to earn the degree, only the
three core courses are specifically required.
Students must also satisfy a laboratory requirement. (See page 35.)

B.S. in Biological Sciences
The B.S. curricula stress theoretical and experimental approaches and the development of expertise in a focused field of biology, including analysis of results in the current scientific literature. Breadth of background in biology is achieved through the three biology introductory courses, three to six advanced courses, and one to two additional biology diversification courses (depending on the concentration) selected from outside the area of specialization. To earn a B.S. degree, a total of 40 to 47 credits of coursework in the biological sciences is required.

B.S. in Biological Sciences:
Biochemistry
Studies include basic concepts of metabolism, protein structure and function, and experimental techniques. In the senior year a wide variety of optional courses is offered allowing specialization in enzymology, membrane biochemistry, DNA, and RNA structure and formation. (See page 33.)

B.S. in Biological Sciences:
Cell and Developmental Biology
Studies include the analysis of the structure and function of cells, the organization and interaction of cells and tissues, and the processes of development responsible for cell and tissue differentiation and production of the adult form. Emphasis is placed on the molecular bases for cellular and developmental processes. (See page 35.)

B.S. in Biological Sciences:
Evolutionary Biology and Ecology
Studies include evolution, ecology, animal behavior, population genetics, ecological genetics, and molecular evolution. The major emphasis in all courses is on the dynamic proc-esses influencing organisms and populations in nature. The subject matter presented concentrates on integrating comparative, experimental, and theoretical methods to study evolutionary and ecological processes. An emphasis in this program is the integration of behavioral, ecological, molecular, and genetic methods to investigate ecological and evolutionary questions. (See page 35.)
B.S. in Biological Sciences:
Microbiology
The introductory course considers how micro-organisms are adapted to their environment. In advanced courses, emphasis is placed on the molecular functioning of microorganisms, covering such topics as microbial physiology, microbial genetics, industrial microbiology, immunology, virology, and pathogenic microbiology. (See page 38.)

B.S. in Biological Sciences:
Molecular Genetics
Studies include chromosome structure, the molecular mechanisms of DNA replication, DNA mutations and repair, DNA recombination, and the regulation of gene expression. Emphasis is placed on experimental approaches, including recombinant DNA technology. (See page 36.)

B.S. in Biological Sciences:
Neuroscience
Neuroscience, which is an interdisciplinary pursuit, deals with the mechanics by which nervous systems mediate behavior. A combination of coursework and laboratory experience gives students a firm understanding of brain function from the molecular to the behavioral levels. Topics covered include biochemical, anatomical, physiological, and medical aspects of neurobiology. (See page 39.)

ADVANCED PLACEMENT
Students with an AP biology score of 4 or 5 receive 4 general elective credits but not credit towards the biology major or minor.

Students retain these general elective credits regardless of the biology courses they take.

CERTIFICATE IN BIOTECHNOLOGY

The program for the Certificate in Biotechnology is designed to give students the specialized background needed for entry into biotechnology jobs or for advanced study in the field. Requirements for the certificate complement the B.A. or B.S. tracks in biological science; students in other degree programs may also be eligible. The certificate is administered through the Undergraduate Program in Biology and Medicine Office. Interested students should contact this office for further information.

The Certificate in Biotechnology will be awarded upon graduation to those who have successfully completed the following requirements:

Biology Courses—three (12 credits) with associated labs: BIO 110 or 112; 111 or 113; 198; and BIO/BCH 250

Computer Technology Courses—one (4 credits): CSC 170, 171, ECE 114 or an approved equivalent

Microbiology Courses—one (4 credits): MBI 220 or MBI 431 (offered every other year); Laboratory Experience—two (8 credits): one from group A and one from group B

Group A: MBI 221W or BIO 268

Group B: BIO 228, BCH 208, MBI 221W, or BIO 268

For more information, please visit the UPBM Web site at www.rochester.edu/College/BIO/UPBM.

INDEPENDENT RESEARCH, DEGREES WITH DISTINCTION, AND COURSE OFFERINGS

The facts, theories, and principles taught in our formal courses ultimately derive from research in the laboratory or the field. Students are encouraged to experience the challenges, successes, frustrations, and excitement of research by arranging independent research in the laboratories of individual members of the faculty in the Undergraduate Program in Biology and Medicine and faculty in various departments in the nearby University of Rochester School of Medicine and Dentistry. The diversity of the faculty's research interests gives students the opportunity to select projects from a wide variety of fields. Work in a laboratory provides an inside view of science and scientists that cannot be gained through lectures or reading and is particularly valuable for undergraduates who contemplate careers in research. Occasionally students' contributions to research are incorporated into published journal articles, and the students are listed as coauthors of these papers.

Independent research may be arranged for formal course credit (courses numbered 395). Each semester approximately 50 to 60 students take independent research courses with faculty members in the UPMB program.
Research projects can also be conducted during the summer through de Kiewiet Summer Research Fellowships, awarded on a competitive basis to students in program tracks.

Students who have demonstrated ability and initiative in an independent research project may be recommended for a degree with distinction in research after successful com-pletion and defense of a written dissertation. The deadline for applying for a degree with distinction in research is February 28 of the senior year. However, it is necessary to plan the research project well beforehand. Specific information is available from the Undergraduate Program in Biology and Medicine Office (402F Hutchison Hall).

UPPER-LEVEL WRITING REQUIREMENT

Majors in all of the biology department's areas of concentration must complete either two upper-level writing requirements in their major or one in their major and one in another natural science. When students declare their major, they are advised of the possible ways to meet the requirement. For more information, please visit the UPBM Web site at www.rochester.edu/College/BIO/UPBM.

BIOCHEMISTRY AND BIOPHYSICS

Robert A. Bambara, Ph.D. (Cornell) *Professor of Oncology in Biochemistry and Biophysics and of Microbiology and Immunology; Chair of the Department*
William A. Bernhard, Ph.D. (Penn State) *Professor of Biochemistry and Biophysics*
Philip J. Fay, Ph.D. (Rochester) *Professor of Biochemistry and Biophysics*
Thomas E. Gunter, Ph.D. (California, Berkeley) *Professor of Biochemistry and Biophysics*
Jeffrey J. Hayes, Ph.D. (Johns Hopkins) *Professor of Biochemistry and Biophysics and of Oncology in the Cancer Center*
Russell Hilf, Ph.D. (Rutgers) *Professor of Biochemistry and Biophysics and of Oncology in the Cancer Center*
Mahin D. Maines, Ph.D. (Missouri) *Professor of Biochemistry and Biophysics and of Environmental Medicine, and Dean's Professor of Toxicology in the Dean's Office*
Lynn E. Maquat, Ph.D. (Wisconsin-Madison) *Professor of Biochemistry and Biophysics*

Eric M. Phizicky, Ph.D. (Cornell) *Professor of Biochemistry and Biophysics*
Terry Platt, Ph.D. (Harvard) *Professor of Biology and Adjunct Professor of Biochemistry and Biophysics*
Fred Sherman, Ph.D. (California, Berkeley) *Marie Curran Wilson and Joseph C. Wilson Professor of Biochemistry and Biophysics*
William Simon, Ph.D. (Harvard) *Professor of Biochemistry and Biophysics*
Harold C. Smith, Ph.D. (Buffalo) *Professor of Biochemistry and Biophysics*
Mark E. Dumont, Ph.D. (Johns Hopkins)
Associate Professor of Biochemistry and Biophysics
Barry A. Goldstein, Ph.D. (Rochester) *Associate Professor of Biochemistry and Biophysics*
Elizabeth J. Grayhack, Ph.D. (Cornell)
Associate Professor of Biochemistry and Biophysics
David A. Pearce, Ph.D. (Bath) *Associate*
Professor of Biochemistry and Biophysics
Joseph E. Wedekind, Ph.D. (Wisconsin-
Madison) *Associate Professor of Biochemistry and Biophysics*
Yi-Tao Yu, Ph.D. (Case Western Reserve)
Associate Professor of Biochemistry and Biophysics
Sayeeda B. Zain, Ph.D. (Glasgow) *Associate Professor of Oncology in Biochemistry and Biophysics*
Alan A. Grossfield, Ph.D. (John Hopkins)
Assistant Professor of Biochemistry and Biophysics
Fred Hagen, Ph.D. (Calgary) *Assistant*
Professor of Biochemistry and Biophysics
Clara L. Kielkopf, Ph.D. (California Institute of Technology) *Assistant Professor of*
Biochemistry and Biophysics
David H. Mathews, M.D. (Rochester)
Assistant Professor of Biochemistry and Biophysics
Joshua Munger, Ph.D. (Chicago) *Assistant Professor of Biochemistry and Biophysics*

REQUIREMENTS FOR BIOCHEMISTRY

- Introductory Courses—Three (12 credits). BIO 110 or 112; 111/111L or 113/113L; and BIO 198/198L.
- Laboratory Experience—One and a half labs (5 credits). BCH 208 and one from the following: BIO 111L, 113L, 198L, or 151.
- Required Biochemistry Core Courses—Six (24 credits). BCH 250, BIO 202, IND 408, 410, and two courses from the following: BCH 412, BIO 243, CHM 252, 437, IND 409, 447, MBI 473, or BCH 395 (only one semester of BCH 395 is allowed to count in the track requirements).
- Elective/Diversification—One course from outside the biochemistry curriculum. It is to be selected from those courses offered through the Undergraduate Program in Biology and Medicine and be approved by the track coordinator.
- Allied Fields—Nine courses (36 credits)
  1. Two semesters of calculus.
  2. Four semesters of chemistry (two general and two organic courses) with labs.
  3. Two semesters of calculus-based physics with labs.
  4. One additional approved course in math, statistics, or computer science.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

208. Biochemistry Laboratory. A laboratory course designed to introduce students to the theory and practice of biochemical, molecular, and structural biology techniques. Students gain first-hand experience with state-of-the-art techniques and data analysis through their participation in experiments that emphasize particular assays, methods, or instrumentation. Computational analysis of macromolecular structure and DNA sequence database searches and alignments are integral components of the students' experience. Topics covered are agarose gel and SDS polyacrylaminade gel electrophoresis; computer-assisted protein structure analysis, DNA sequence database searching, and DNA sequence alignment; laboratory safety; DNA isolation; expression of recombinant proteins, fractionation and purification of proteins; affinity chromatography, ion exchange chromatography, measurements of volume and mass and calculation of concentration; polymerase chain reaction, DNA restriction fragment analysis; cloning and manual and automated DNA sequencing; protein crystallization; protein structure assessment; setting up enzyme reactions and measuring kinetic parameters; spectrophotometry and western blotting. (Spring)

250/BCH 250. Biochemistry. Covers fundamental aspects of biochemistry, including bioenergetics, protein structure, kinetic

analysis of enzyme action, and general intermediary metabolism. The text is the 4th edition of Lehninger's Principles of Biochemistry by Nelson and Cox, with its accompanying Web site, which includes access to CHIME tutorials that explore structure-function relationships in biomolecules. Three 50-minute lectures plus 10 two-hour workshops. Prerequisites: BIO 110 or 112, plus CHM 203 and 204 (may be taken concurrently), or permission of instructor. (Spring and Summer)

395. Independent Research in Biochemistry. Arrangements for independent research in biochemistry can be made with any faculty member in the biochemistry track. Contact can be made directly with the appropriate faculty member or through the Committee for the B.S. Track in Biochemistry. Students may take this course up to two times with a particular faculty member. BCH 395 courses may be used to fulfill some of the requirements for distinction in research, provided that prior approval of the track coordinator is obtained.

408. Biochemistry. This course is designed primarily for graduate students. Eighty-minute lectures cover selected topics in modern biochemistry including analysis of protein and domain structure by classical and modern methods. Includes mass spectrometry, NMR, X-ray crystallography, and other biophysical techniques; protein-ligand and protein-protein interactions; enzyme kinetics and catalytic mechanisms; DNA and RNA structure and function; cellular energy production and utilization; and glycobiology. In addition to lectures, workshops are held once a week, during which time selected papers from the literature are discussed (BCH 250/450). Prerequisite: a one-semester introductory course in biochemistry or equivalent. (Fall)

410. Molecular Biology and Genetics. This course is designed primarily for graduate students. One-hour lectures cover modern topics of interest, including DNA replication; DNA repair and mutagenesis; regulation of RNA transcription in eukaryotes; RNA processing, and protein translation. Emphasis is placed on both biochemical and genetic approaches to the study of these problems. Special additional topics include genomics as an approach to regulation and mammalian genetic techniques of analysis. (Spring)

412. Advanced Topics in Biological Macromolecules. An advanced biochemistry lecture course intended for senior undergraduate and graduate students. Topics include DNA structure, RNA structure and catalysis, nucleic acid-protein interactions, X-ray crystallography, NMR spectroscopy, protein folding, molecular chaperones, membrane proteins, post-translational modifications of proteins, ATPases, G protein and function, protein-protein interactions, proteases and clotting. Presentation of a journal article in a workshop. Preparation of a paper based on a topic in the course. Prerequisite: IND 408. (Spring)

The following is a typical program:

First Year

Fall	*Spring*			
CHM 131	CHM 132			
MTH 141,161,161Q,	MTH 142,162, 162Q,	or 171Q	or 172Q	
BIO 110 or 112	BIO 111/111L or	Elective	113/113L	
	Elective (CAS writing		one semester)	

Second Year

CHM 203 & 207 lab	CHM 204 & 208 lab			
or	*or*			
CHM 171Q & 173Q lab	CHM 172Q & 210 lab			
BIO 198/198L	BIO/BCH 208			
Elective	MTH 163 or STT 212			
Elective	Elective			

Third Year

PHY 113 or 121	PHY 114 or 122					
BIO 202	BCH 208W					
BIO elective	BIO elective	IND 408 IND 410 (either junior				or senior year)

Fourth Year

IND 408	IND 410 (either junior	Advanced Biochemistry				or senior year)
Elective	Advanced Biochemistry	Elective	Elective	Elective	Elective	
	Elective					

Further information is available from the Biochemistry Track Coordinator, Box 712, University of Rochester Medical Center, 601 Elmwood Avenue, Rochester, New York 14642-8607.

BIOLOGY

Gloria M. Culver, Ph.D. (Rochester) *Professor of Biology*
Thomas Eickbush, Ph.D. (Johns Hopkins) *Professor of Biology; Chair of the Department*
David S. Goldfarb, Ph.D. (California, Davis) *Professor of Biology*
John Jaenike, Ph.D. (Princeton) *Professor of Biology*
Joanna B. Olmsted, Ph.D. (Yale) *Professor of Biology; Dean of Arts and Sciences*
H. Allen Orr, Ph.D. (Chicago) *University Professor, Shirley Cox Kearns Professor and Professor of Biology*
Terry Platt, Ph.D. (Harvard) *Professor of Biology*
John H. Werren, Ph.D. (Utah) *Professor of Biology*
Cheeptip Benyajati, Ph.D. (Princeton) *Associate Professor of Biology*
Xin Bi, Ph.D. (Johns Hopkins) *Associate Professor of Biology*
James D. Fry, Ph.D. (Michigan) *Associate Professor of Biology*
Vera Gorbunova, Ph.D. (Weizmann Institute of Science) *Associate Professor of Biology*
Rulang Jiang, Ph.D. (Wesleyan University) *Associate Professor of Biomedical Genetics in the Center for Oral Biology, of Dentistry and of Biology*
Daven Presgraves, Ph.D. (Rochester) *Associate Professor of Biology*
Elaine Sia, Ph.D. (Columbia) *Associate Professor of Biology*
Michael Welte, Ph.D. (Chicago) *Associate Professor of Biology*
Daniel Garrigan, Ph.D. (Arizona) *Assistant Professor of Biology*
Richard Glor, Ph.D. (Washington University) *Assistant Professor of Biology*
Heinrich Jasper, Ph.D. (Heidelberg) *James P. Wilmot Distinguished Assistant Professor and Assistant Professor of Biology*
J. David Lambert, Ph.D. (Arizona) *Assistant Professor of Biology*
Robert Minckley, Ph.D. (Kansas) *Adjunct Assistant Professor of Biology*
Douglas Portman, Ph.D. (Pennsylvania) *Assistant Professor of Biomedical Genetics and of Biology*
Justin M. Ramsey, Ph.D. (University of Washington) *Assistant Professor of Biology*
Andrei Seluanov, Ph.D. (Weizmann Institute of Science) *Assistant Professor (Research) of Biology*
Alan Dietsche, Ph.D. (Kentucky) *Senior Lecturer in Biology*
Anthony J. Olek, Ph.D. (SUNY, Albany) *Senior Lecturer in Biology*

Graduate students, in partial fulfillment of requirements of their Ph.D. degree, work closely with faculty as teaching assistants to aid in instructional programs.

The Department of Biology administers curricula leading to four of the seven undergraduate concentrations offered through the Undergraduate Program in Biology and Medicine: (1) B.A. in biology, (2) B.S. in biological sciences: cell and developmental biology, (3) B.S. in biological sciences: molecular genetics, and (4) B.S. in biological sciences: evolutionary biology and ecology. A minor in biology is also available. (The general structure of the Undergraduate Program in Biology and Medicine is described on page 32.)

PLANNING A CURRICULUM

See Undergraduate Program in Biology and Medicine, page 32, or visit UPBM Web site: www.rochester.edu/College/BIO/UPBM.

B.A. IN BIOLOGY

The requirements for the B.A. in biology are

- Introductory Courses—Three (12 credits). BIO 110 or 112, 111/111L or 113/113L, and 198/198L.
- Laboratory Experience—One and one-half laboratories. Any combination of laboratories listed below will satisfy the laboratory requirement. Most students complete BIO 111L, 113L, 151, and 198L concurrently with the lecture course and then choose a third laboratory that complements an interest. Half labs (meet once a week) are BIO 111L, 113L, and 198L, 203, 204, 204, EES 271. Full labs (meet twice per week) are BIO 225, 228, 268, BCH 208, MBI 221, NSC 203, and BIO 395.
- Advanced Courses—Two (8 credits.) Select one course from groups A and B. Group A: BIO 205, Evolution; BIO 232, Genetic Diversity in Human Populations; BIO 247, Environmental Animal Physiology; BIO 260, Animal Behavior; BIO 263, Ecology. Group B: BIO 250, Biochemistry; BIO 202, Molecular Biology; BIO 210, Molecular Cell Biology; BIO 215, Molecular Biology

of Cell Signaling; and BIO 226, Developmental Biology.

- Elective/Diversification—Three courses (12 credits.) Three courses are to be selected from any of those offered through the Undergraduate Program in Biology and Medicine, including approved Independent Research 395. Biology elective courses must be 200-level or higher. For lists of UPBM elective/diversification courses please visit the UPBM Web site at www.rochester.edu/College/BIO/UPBM.
- Allied Fields— Eight courses with indicated laboratories
  1. Two semesters of general chemistry with lab.
  2. One semester of organic chemistry with lab.
  3. One semester of general physics with lab.
  4. Two semesters of calculus.
  5. Two additional approved courses in math, statistics, computer science, chemistry, or physics.

B.S. IN BIOLOGICAL SCIENCES:
CELL AND DEVELOPMENTAL
BIOLOGY

Cell biology is the study of the structure, composition, and function of cells and their component parts. Cell biologists seek to elucidate the common features of different kinds of cells as well as the unique aspects of structure and physiology that confer special functions on different types of cells in a tissue, organ, or organism. The fields of cell biology and developmental biology are closely related. Developmental biology deals with the proc-esses involved in the production of an adult organism from a fertilized egg. A major facet of developmental biology is the study of the mechanisms by which differentiated cells achieve and maintain their special properties. Modern investigations in both cell and developmental biology are extensively integrated with the theories, results, and techniques of genetics, molecular biology, and biochemistry.

The requirements for the B.S. in cell and developmental biology are

- Introductory Courses—Three (12 credits). BIO 110 or 112, 111 or 113, and #198
- Laboratory Experience—One and one-half labs (6 credits total). BIO 228. Strongly recommended half labs (1 credit) are BIO 111L or 113L and 198L.
- Required Cell and Developmental Biology Core Courses—Five courses (20 credits). BIO 210, 226, 250, and two courses to be chosen from the following list or from courses approved by the track coordinator: BIO 220, 222, 243, IND 447, BIO 215, MBI 473.
- Elective/Diversification Courses—One (4 credits). To be selected from those courses offered through the Undergraduate Program in Biology and Medicine, outside of the BCD curriculum, and approved by the track coordinator. Visit the UPBM Web site for course offerings: www.rochester.edu/College/BIO/UPBM/upbmcourses.htm.
- Allied Fields—Nine courses (36 credits)
  1. Two semesters of calculus.
  2. Four semesters of chemistry (two general and two organic courses) with lab.
  3. Two semesters of calculus-based physics (PHY 113, 114 or PHY 121, 122) with lab.
  4. One additional approved course in math, statistics, or computer science.

B.S. IN BIOLOGICAL SCIENCES:
ECOLOGY AND EVOLUTIONARY BIOLOGY

This track encompasses the studies of behavior, ecology, population genetics, evolution and biodiversity. Together these disciplines attempt to understand how the processes of adaptation affect the activities of individuals, local breeding and foraging groups, and larger populations by natural selection, as well as by other forces that shape the genetic and phenotypic character of populations and species. The sheer number of the mechanisms underlying population phenomena and especially evolutionary change, as well as the numbers of individuals and genes involved and the great variety of different kinds of ecological interactions possible, predispose the subject to formulation in mathematical models that must be tested through observation of natural populations. Students in this program are encouraged to gain experience with the use of analytical, sampling, and experimental techniques of laboratory and field biology.

The requirements for the B.S. in evolutionary biology and ecology are

- Introductory Courses—Three (12 credits). BIO 110 or 112; 111 or 113; and 198.
- Laboratory Experience—Three or four courses (6 credits). BIO 111L, 198L, and 225.
- Required Ecology and Evolutionary Biology Core Courses—Four (16 credits). BIO 205 and 263, plus two of the following: BIO 232, 260, 265, 266, or EES 201.
- Elective/Diversification—Two courses (8 credits). These courses must be 200-level courses from outside the BEB curriculum. Both courses are to be selected from the courses offered through the Undergraduate Program in Biology and Medicine and approved by the

track coordinator. Courses listed above as Ecology and Evolutionary Biology core courses may not be used to fulfill the elective/diversification requirement.

- Allied Fields—Nine courses (36 credits)
  1. Two semesters of calculus.
  2. Two semesters of general chemistry with lab.
  3. One semester of organic chemistry with lab.
  4. One semester of calculus-based physics with lab.
  5. One semester of statistics.
  6. Two additional approved math, statistics, computer science, physics, or chemistry courses.

NOTE: CSC 108 and 110 are not acceptable.

B.S. IN BIOLOGICAL SCIENCES: MOLECULAR GENETICS

Molecular genetics is the study of the structure of genes and the mechanisms involved in their maintenance, alteration (mutation), expression, replication, recombination, and transmission. Molecular geneticists seek to describe these events in terms of the properties and interactions of DNA, RNA, proteins, and other molecules.

The requirements for the B.S. in molecular genetics are

- Introductory Courses—Three (12 credits). BIO 110 or 112; 111 or 113, and 198.
- Laboratory Experience—One and a half laboratories. BIO 268 (4 credits) plus one other full or half laboratory. It is recommended that students take BIO 111L and 198L as part of the introductory courses to complete the requirement. Please visit the UPBM Web site for the full list of laboratories: www.rochester.edu/College/BIO/UPBM/upbmlab.htm.
- Molecular Genetics Core Courses—Five (20 credits). BIO 250, 202, 243, and two courses to be chosen from the following list or from courses approved by the track coordinator: BIO 215, 210, 222, 226, IND 410.
- Elective/Diversification—One course (4 credits). This course must be a 200-level course from outside the molecular genetics curriculum. It is to be selected from those courses offered through the Undergraduate Program in Biology and Medicine and must be approved by the track coordinator. Visit the UPBM Web site for course offerings: www.rochester.edu/College/BIO/UPBM/upbmcourses.htm.
- Allied Fields—Nine courses (36 credits)
  1. Two calculus courses.
  2. Four semesters of chemistry (two general and two organic courses) with lab.
  3. Two semesters of calculus-based physics.
  4. One additional approved course in math, statistics, or computer science.

MINOR IN BIOLOGY

The requirements for a minor in biology are

- Introductory Courses—Three (14 credits). BIO 110 or 112; 111 or 113; and 111L or 113L, or 198 or 198L.
- Advanced Courses—Two (minimum 8 credits). These courses are to be selected from any of those offered through the Undergraduate Program in Biology and Medicine and approved by the program director. Please visit UPBM Web site for course offerings: www.rochester.edu/College/BIO/UPBM/upbmcourses.htm.
- Laboratory Requirement—One lab or one lab equivalent (two half labs). BIO 111L, 113L, 151, and 198L are half labs as they are included in the courses.
- Allied Fields
  Two courses of chemistry with labs.

No independent study or research course (391 or 395) may be counted toward the minor in biology. The biology department undergraduate advisor grants approval of courses chosen for the minor.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

104. Ecosystem Conservation and Human Society. As the natural resources on which human society depends are depleted, the need for sound conservation policies increases. The course examines a new approach in conservation biology that identifies and places economic value on the services that natural ecosystems provide. Such services are basic to sustainable societies and include clean water and air, waste decomposition, pollination, and farmland productivity. Major themes the course covers include an overview of other approaches in conservation biology, a review of the services that ecosystems provide, ways the value of these services are determined, and how this novel approach is influencing economic and political policy at local, national, and international levels. (Fall)

110. Principles of Biology I. The first semester in a yearlong course sequence designed for majors and minors in biology. Major topics include biochemistry, molecular and cellular evolution, cell reproduction, fundamentals of genetics, and molecular biology. Prerequisites: Completion or concurrent enrollment in CHM 131 or equivalent. Three 50-minute lectures and one two-hour problem-based workshop per week. (Fall)

111. Principles of Biology II. The second semester of the introductory sequence designed for majors in biology. Topics include evolution (natural selection, speciation, plant and animal diversity), ecology (population genetics, ecosystem structure, species interactions), plant and animal physiology. Prerequisites: BIO 110 and completion or concurrent enrollment in CHM 132. Three one-hour exams and a comprehensive final exam. (Spring)

111L. Introductory Biology Laboratory. This is the lab course that accompanies the lecture course Principles of Biology II. The content of the course is drawn from the lecture material. Topics include plant and animal diversity, anatomical dissections, and methods in bacteriology, animal behavior, and basic physiology. An emphasis is placed on problem solving, critical thinking, and experimental design. Prerequisites: BIO 110 or 112 and concurrent enrollment in BIO 111. (Spring)

112. Biology Perspectives I. The first semester of a two-course introductory sequence for students with a strong background in science. Topics include biochemistry, molecular and cellular evolution, cell reproduction, fundamentals of genetics, and molecular biology. This course differs from BIO 110 in that there is greater emphasis on experimental approaches, data analysis, and quantitative methods, and may include reading original papers. A significant writing component includes preparation of a book review (from selected titles, such as The Selfish Gene). Note, both BIO 110 and 112 are designed to prepare students who intend to major in biology. Prerequisites: Students with a score of 4 or 5 on the AP Biology test, particularly those who have interest in research, and completion or concurrent enrollment in CHM 131 or equivalent. (Fall)

113. Biology Perspectives II. Second semester of a two-course introductory sequence for students with a strong background and interest in science. Topics include evolution, organismal diversity, ecology, and functional biology. This course differs from BIO 111 in that there is greater emphasis on experimental approaches, data analysis, and quantitative methods, and includes reading original papers. Note, both BIO 110 and 112 are designed to prepare students who intend to major in biology. Prerequisites: BIO 112 or AP Biology score of 4 or 5 and concurrent enrollment in CHM 132. (Spring)

113L. Perspectives in Biology Lab. This is the laboratory course that accompanies the lecture course Perspectives in Biology II. Course content is drawn from the lecture material and includes biological diversity, ecology, evolution, animal behavior, physiology, and bioinformatics. Emphasis is placed on problem solving, critical thinking, and experimental design and data analysis. Lab meets for one three-and-a-half-hour session each week. Prerequisites: BIO 110 or 112 and concurrent enrollment in BIO 113. (Spring)

151L. Introduction to Biochemistry Lab. The course is designed to introduce sophomore biology majors to experimental approaches in biochemistry, including enzyme assays, protein analysis, and the use of antibodies. Students develop light microscopic skills, e.g., using fluorescent dyes in organelle isolation. The laboratory emphasizes experimental design and data analysis and complements BIO 250, Biochemistry. This course can be used to satisfy a half laboratory requirement in the B.A. and other UPBM tracks. Prerequisites: One year of introductory biology and chemistry (e.g., BIO 110 and 111, CHM 131 and 132). Genetics (e.g., BIO 198) recommended. (Spring)

198. Principles of Genetics. Methods of genetic analysis are stressed. Topics include Mendelian assortment; gene interaction; linkage and mapping; methods of genetic analysis in yeast, bacteria, and phage; DNA replication, recombination, repair, and mutation; gene expression and its regulation; transposons and retroviruses; recombinant DNA technologies; cancer as a genetic disease. Three 50-minute lectures and one 50-minute problem-based recitation per week. Prerequisites: BIO 110 and completion or concurrent enrollment in CHM 203 or 205. (Fall and Summer)

198L. Principles of Genetics Lab. This course is an introduction to basic genetic theory and laboratory practices. Topics covered are classical inheritance in eukaryotes, bacterial genetics, and molecular technology techniques. One three-and-a-half-hour laboratory per week. Prerequisite: concurrent with BIO 198 or after completion of BIO 198. (Fall)

201. Lectures in Physiology. Function of various mammalian systems with special emphasis on humans. Topics include excitable tissue, respiration, nutrition, reproduction, endocrinology, skeletal, circulatory and renal systems; homeostatic mechanism. Students attend lectures and take examinations with students in BIO 204, Mammalian Physiology, and attend one hour of mandatory recitation per week. Laboratory exercises are not conducted. Three 50-minute lectures and one 50-minute recitation per week. Prerequisites: BIO 110 or 112 and 111 or 113 or permission of the instructor. (Spring)

202. Molecular Biology. This course deals with the molecular mechanisms of gene replication, gene expression, and the control of gene expression in both prokaryotic and eukaryotic cells. Topics include enzymatic mechanisms of DNA replication, recombination and repair; transposable elements; DNA transcription; RNA splicing; RNA translation; repressors, activators, and attenuators; recombinant DNA and genetic engineering. Two 75-minute lectures and one 75-minute recitation per week. Prerequisites: BIO 198 and BIO 250 strongly recommended; should have completed biology core as well as chemistry requirements. (Fall)

203. Mammalian Anatomy. This course deals with the structural and systematic anatomy of animals with special emphasis on human beings. Laboratory includes the dissection of fresh and preserved tissue plus analysis of structures and systems. Three 50-minute lectures and one three-hour laboratory per week. Prerequisites: BIO 110 or 112 and 111 or 113 or permission of instructor

204. Mammalian Physiology. Function of various mammalian systems with special emphasis on humans. Topics include excitable tissue; respiration; nutrition; reproduction; endocrinology; skeletal, circulatory, and renal systems; homeostatic mechanisms. Three 50-minute lectures and one three-hour laboratory per week. Three 50-minute lectures and one three-hour laboratory per week. Prerequisite: BIO 203 or permission of instructor. (Spring)

205. Evolution. Fundamentals of evolution. Topics include natural selection and its ecological basis, population genetics including selection and drift, speciation, and molecular evolution including the neutral theory, molecular phylogeny, and the molecular clock. Two 75-minute lectures and one 50-minute recitation per week. Prerequisites: BIO 111 or 113 and 198. (Fall)

210. Molecular Cell Biology. An intermediate-level course that covers fundamental cell processes at the molecular level. Topics include organelle structure and functions, membrane biogenesis, cytoskeleton, cell signaling, cell cycle growth and death. Prerequisites: BIO 110 or 112 and 111 or 113 and BIO 198 and 250 are strongly suggested. (Fall)

215. Molecular Biology of Cell Signaling. This course offers an introduction to cell signaling. The course explores basic molecular mechanisms of signal transduction, and studies how these mechanisms are used in different contexts to direct cell fate during development, physiology, and disease. The course draws heavily on experiments from the classic and most recent primary literature. Two 75-minute lectures and one 50-minute recitation per week. Prerequisites: BIO 198. One of the following: BIO 202, 250 strongly recommended. (Spring)

220. Advanced Cell Biology. An advanced course focusing on a mechanistic understanding of cellular organization and function. This course relies heavily on the primary research literature, classic and recent, and the design and interpretation of experiments, drawn from biochemistry, microscopy, and genetics. Topics include the cytoskeleton, membrane traffic, cell-cell signaling, and the cell cycle. Active participation in classroom discussions is an essential feature of the course. Prerequisites: BIO 198, 210, and 250. (Fall).

222. Biology of Aging. This course focuses on molecular mechanisms of aging and its relation to DNA damage and repair. Evolution of aging, model organisms used in aging research, human progeroid syndromes, and interventions to slow aging are discussed. Two 75-minute lectures and one 50-minute recitation per week. Prerequisites: BIO 198. BIO 202 recommended. (Fall)

225. Laboratory in Ecology and Evolutionary Biology. This course emphasizes the development of testable questions and implementation of appropriate observations and experiments on a series of topics in ecology and evolution. Many of the mini-studies are done in the field on non-model organisms native to New York. Students gain experience on field and lab methods used in ecology and evolutionary biology (including relevant computer applications), critiquing published scientific studies, writing scientific reports, and presentation of scientific results. Prerequisite: past or current enrollment in BIO 205 or 263.

226. Developmental Biology. This course deals with the cellular and molecular aspects of animal development, with emphasis on processes and underlying mechanisms. Topics include fertilization, cloning (of embryos), embryonic cleavage, gastrulation, early development of model vertebrates and invertebrates, patterning of cell fates along embryonic axes of Drosophila and vertebrates, organogenesis, sex determination, and stem cells. Two 75-minute lectures per week and a 50-minute recitation per week. Prerequisite: BIO 198 or permission of the instructor. (Fall)

228. Laboratory in Cell and Developmental Biology. This course is designed to provide (1) training in specific methods used in molecular, cell, and developmental biology research, with emphasis on data acquisition and analysis; (2) experience in the design and execution of experiments, writing scientific reports, and public scientific presentation. Two four-hour labs and one 50-minute recitation per week. Prerequisites: BIO 250 strongly recommended; should have completed biology core as well as chemistry requirement. (Fall)

232. Genetic Diversity and Human Disease. Examines genetic diversity in human populations from an evolutionary perspective, with particular attention to inherited diseases and disease-related traits. Covers single gene disorders, chromosome abnormalities, and diseases with complex inheritance. Emphasis is on using evolutionary and genetic principles to understand why inherited diseases persist, rather than on clinical details of particular diseases. Other topics include the use of genetic information to reconstruct human migrations and human evolution. About one-third of the course grade will be based on group projects in which students research practical issues in human genetics and present their findings to the class. Three 50-minute lectures and one 50-minute recitation per week. Prerequisite: BIO 198. (Spring)

243. Eukaryotic Gene Regulation. This course examines mechanisms of transcription initiation, eukaryotic chromosome structure and its modifications, mechanisms of chromatin-mediated regulation of gene expression, as well as epigenetics and functional genomics. Lectures and readings draw heavily on primary literature both classic and most recent. Two 75-minute lectures and a one-hour recitation per week. Prerequisites: BIO 198, 202, and 250; 150 strongly recommended. (Spring)

247. Environmental Animal Physiology. This course is designed for sophomore biology majors who want to deepen their understanding of animal function by examining how animals cope with environmental challenges. This includes cellular and physiological adaptations to extremes of temperature, salinity, and altitude. This course can be used to satisfy an upper-level elective/diversity requirement in all UPBM tracks and as a "group" A requirement in the B.A. track. Prerequisites: one year of introductory biology and chemistry (e.g., BIO 110 and 111, CHM 131 and 132). Genetics (e.g., BIO 198) recommended. (Spring)

250. Introduction to Biochemistry. Covers fundamental aspects of biochemistry, including bioenergetics, protein structure, kinetic

analysis of enzyme action, and general intermediary metabolism. The text used is the 4th edition of Lehninger's Principles of Biochemistry by Nelson and Cox, with its accompanying Web site, which includes access to CHIME tutorials that explore structure-function relationships in biomolecules. Three 50-
minute lectures plus 10 two-hour workshops. Prerequisites: BIO 110 or 112, plus CHM 203 and 204 (may be taken concurrently) or permission of instructor. (Spring and Summer)

260. Animal Behavior. Examines animal behavior from an ecological and evolutionary perspective. Topics include social organization, mating systems, foraging, aggression, and animal learning. Students also learn quantitative techniques in behavioral biology. Three 50-minute lectures and one 50-minute recitation per week. Prerequisite: BIO 111 or 113. (Fall)

263. Ecology. A survey of adaptations to the physical environment, dynamics of natural populations, interactions between species, and human impact on the environment. Three 50-minute lectures and one 50-minute recitation per week. Three 50-minute exams and a comprehensive final exam. Prerequisites: BIO 111 and MTH 142 or 161. (Fall)

265. Molecular Evolution. This course explores evolution at the molecular level. Basic evolutionary principles are used to infer history from DNA sequences; to determine what forces have shaped the evolution of genes and genomes; to understand the relationship between molecular evolution and phenotypic evolution; and to address applied problems, like assigning biological function to genome sequences, finding the sources of epidemics, and finding the genes involved in human disease. Prerequisites: BIO 111, 198, 205. (Spring)

266. Tree of Life. This course is centered around a survey of life's diversity with an emphasis on understanding phylogenetic relationships, trends in diversity over macroevolutionary time, and the use of comparative methods to address topics such as adaptation and convergent evolution. Methods for reconstructing phylogenetic trees (e.g., neighbor-joining, parsimony, maximum likelihood, Bayesian), and the application of these trees to macroevolutionary questions is reviewed. Prerequisites: BIO 111 and 113. (Spring)

268. Laboratory in Molecular Genetics. A series of experiments, each lasting two to three weeks, introducing various organisms and techniques. Emphasizes (1) data acquisition and analysis and (2) experience in the design and execution of experiments, writing scientific reports, and public scientific presentation. Two four-hour labs and one one-hour recitation per week. Prerequisite: BIO 202 or permission of instructor. (Spring)

391. Independent Study. A special program of reading in advanced aspects of biological science may be arranged with a faculty member of the department according to the interests of individual students. (Fall and Spring)

395. Independent Research. A special program of laboratory or field work in advanced aspects of biological science may be arranged with a faculty member of the department according to the interests of individual students. (Fall and Spring)

Other biology courses with numbers of 400 and above, although intended primarily for graduate students, are open to qualified juniors and seniors by permission of the instructor. See Official Bulletin: Graduate Studies.

MICROBIOLOGY AND IMMUNOLOGY

Stephen Dewhurst, Ph.D. (Nebraska)
Professor of Microbiology and Immunology

John G. Frelinger, Ph.D. (California Institute of Technology) *Professor of On-cology in Microbiology and Immunology*

Barbara H. Iglewski, Ph.D. (Pennsylvania State) *Professor of Microbiology and Immunology; Chair of the Department*

Jian-Dong Li, M.D. (Qingdao) *Professor of Microbiology and Immunology*

Edith Lord, Ph.D. (California, San Diego) *Professor of Oncology in Microbiology and Immunology*

Robert E. Marquis, Ph.D. (Michigan)
Professor of Microbiology and Immunology

Marilyn A. Menegus, Ph.D. (Cornell)
Professor of Microbiology and Immunology, of Pathology, and of Pediatrics

Jim Miller, Ph.D. (Washington) *Professor of Microbiology and Immunology*

Tim R. Mosmann, Ph.D. (British Columbia) *Professor of Microbiology and Immunology*

Andrea Sant, Ph.D. (Washington) *Professor of Microbiology and Immunology*

Richard Barth, Ph.D. (SUNY, Buffalo)
Associate Professor of Microbiology and Immunology

J. Scott Butler, Ph.D. (Illinois-Urbana) *Associate Professor of Microbiology and Immunology*

Virginia Clark, Ph.D. (Rochester) *Associate Professor of Microbiology and Immunology*

Deborah Fowell, Ph.D. (Oxford) *Associate Professor of Microbiology and Immunology*

Constantine G. Haidaris, Ph.D. (Cincinnati) *Associate Professor of Microbiology and Immunology*

Dwight J. Hardy, Ph.D. (Louisiana) *Associate Professor of Microbiology and Immunology*

Baek Kim, Ph.D. (Arizona) *Associate*
Professor of Microbiology and Immunology

Sanjay Maggirwar, Ph.D. (India) *Associate Professor of Microbiology and Immunology*
Martin S. Pavelka, Jr., Ph.D. (Rochester)
Associate Professor of Microbiology and Immunology
Robert G. Quivey, Jr., Ph.D. (Texas) *Associate Professor of Microbiology and Immunology*
Jacques Robert, Ph.D. (Geneva, Switzerland) A*ssociate Professor of Microbiology and Immunology*
Sanjeev Sahni, Ph.D. (Kanpur) *Associate Professor of Microbiology and Immunology*
David Topham, Ph.D. (Vermont) *Associate Professor of Microbiology and Immunology*
Alexandra M. Livingstone, Ph.D.
(Cambridge) *Research Associate Professor of Microbiology and Immunology*
Sally A. Quataert, Ph.D. (Buffalo) *Research Associate Professor of Microbiology and Immunology*
Mary Anne Courtney, Ph.D. (Louisville)
Assis-tant Professor of Microbiology and Immunology
Michelle Dziejman, Ph.D. (Pennsylvania)
Assistant Professor of Microbiology and Immunology
Minsoo Kim, Ph.D. (Ohio) *Assistant*
Professor of Microbiology and Immunology
José A. Lemos, Ph.D. (Federal Univ. of Rio de Janeiro) *Assistant Professor of Microbiology and Immunology*
Luis Martinez-Sobrido, Ph.D. (Navarra)
Assistant Professor of Microbiology and Immunology)
Toru Takimoto, Ph.D. (Japan-Hokkaido
University-Sapporo) *Assistant Professor of Microbiology and Immunology*
Brian Ward, Ph.D. (Illinois-Urbana) *Assistant Professor of Microbiology and Immunology*
Mingtao Zeng, Ph.D. (Israel-Tel Aviv)
Assistant Professor of Microbiology and Immunology

All members of the faculty may serve as preceptors of MBI 395. The Department of Microbiology and Immunology annually has up to 10 teaching assistants serving as laboratory instructors in introductory courses.

Microbiology, the study of microorganisms, encompasses bacteriology, virology, mycology, and parasitology and is inseparable from molecular biology, genetics, physiology, and immunology. Consequently, the Bachelor of Science degree program in microbiology integrates coursework in many disciplines in order to provide undergraduates with basic knowledge of the field. This program uses the resources of the Department of Microbiology and Immunology of the School of Medicine and Dentistry and the Clinical Microbiology Laboratories of Strong Memorial Hospital to provide undergraduates with a background in general and medical microbiology.

Students earning the B.S. in biological sciences: microbiology will possess a strong foundation in the basic introductory sciences (chemistry, biology, biochemistry), related areas (mathematics and physics), microbiology, and liberal arts. They will be well prepared to continue graduate education in microbiology, another biological science area, or a health care profession.

MICROBIOLOGY CONCENTRATION

Students should declare the concentration toward the end of their sophomore year. During the junior and senior years, advisors from the Department of Microbiology and Immunology will supervise a concentrator's progress. -Microbiology is one of the B.S. tracks in the Undergraduate Program in Biology and Medicine. With satisfactory performance and completion of degree requirements, students will be recommended for the degree of B.S. in biological sciences: microbiology.

REQUIREMENTS FOR CONCENTRATION IN MICROBIOLOGY

Students -concentrating in microbiology are advised to complete the following courses, all of which are requirements for the microbiology B.S. track.

- Introductory Courses—Three (12 credits). BIO 110 or 112; 111/111L or 113/113L; and 198/198L or an approved alternate.
- Required Microbiology Core Courses—Six (24 credits). MBI 220, 221W lab (recommended to be taken in the junior year), BCH/BIO250, and three courses to be
  chosen from the following list: MBI 414, 421, 431, 456, 473.
- Elective/Diversification—*One* course not in the microbiology curriculum. It is to be selected from those courses offered through the Undergraduate Program in Biology and Medicine and approved by the track coordinator. Please visit the UPBM Web site for list of course offerings: www.rochester.edu/College/BIO/UPBM/upbmcourses.htm. It may be another laboratory course (see below).
- Supplementary Laboratory Course—One additional laboratory course (4 credits). It may be a full laboratory course in a biological science (may also satisfy the elective/diversification requirement); two half-

laboratory courses; or an approved XXX 395W Independent Research, which does not count as an elective/diversification course.

- Allied Fields
  1. Two semesters of calculus.
  2. Four semesters of chemistry (two general and two organic courses) with lab.
  3. Two semesters of calculus-based physics (PHY 113, 114 or PHY 121, 122) with lab.
  4. One additional approved course in math, statistics, or computer science.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

220. An Introduction to Microbiology. This course provides an introduction to bacteria and viruses. Major topics discussed are bacterial and viral structure; microbial metabolism, genetics, growth, evolution, diversity, and ecology; and microbial interactions with humans, including nonspecific and specific (immune) host defenses and mechanisms of microbial pathogenesis. Three lectures per week with assigned readings from text. Prerequisites: BIO 110 or 112; 111 or 113; 198; CHM 203 or equivalent. (Fall)

221W. Microbiology Laboratory. This course is designed to accompany MBI 220. It allows the students to have direct experience in handling microorganisms and studying their properties. Emphasis is placed on learning basic laboratory skills and techniques; collecting and recording data; and analyzing experimental results. Some exercises are performed by individual students, while others are carried out in small groups. Each student completes a semester-length project. Lab notebook and independent project reported in paper and presented in poster. Prerequisite: MBI 220 concurrent or previous. (Fall)

395W. Undergraduate Research in Microbiology. For qualified and interested students, research experience in the laboratories of department faculty members may be arranged. Arrangements need to be made well in advance by contacting appropriate faculty members. (Fall and Spring)

The following graduate courses are open to advanced undergraduates with permission of the instructor.

414. Mechanisms of Microbial Pathogenesis. An examination of host-parasite interactions and the mechanisms by which microbes evade the host response and cause disease. The emphasis is on an understanding at the molecular level of microbial pathogenesis, including colonization, invasion, antigen variation, and toxin production and mode of action. In addition, an understanding of how host defense mechanisms interact with pathogenic microbes is examined. (Graduate students must register for MBI 514, Seminar.) Alternate year course. Prerequisite: MBI 220/221. (Spring)

421. Microbial Genetics. This course provides an in-depth examination of representative genetic systems in bacteria and bacterial viruses. Emphasis is placed on the methods of genetic analysis used to study biological function. The material covered includes the nature of bacterial variation, processes affecting gene synthesis and integrity, the nature of gene transfer in bacteria, and the regulation of gene expression in prokaryotes. (Graduate students must register for MBI 521, Seminar.) Prerequisite: MBI 220. (Spring)

431. Microbial Physiology. This course provides a survey of microbial physiology with emphasis on metabolism, regulation, cell walls, membranes, ecology, and adaptation to extreme environments. The class meets twice per week for two lectures of 75 minutes each. Extensive handout materials are provided, and readings are from the current literature.
Prerequisites: Undergraduate biochemistry or permission of the instructor. Doctoral students must register for MBI 531, Seminar. (Fall, every other year)

456. General Virology. Provides an introduction to animal virology, with emphasis on human disease. Topics covered include the following: general properties of viruses, methods in viral research, virus structure, biochemistry of virus replication, virus-host cell interactions, pathogenesis, HIV/AIDS, emerging infections, vaccines, antivirals, and viral vectors and gene therapy. Prerequisite: Basic Biochemistry or Molecular Biology. (Spring, every other year)

473. Immunology. Innate and adaptive immunity; structure and genetics of immunoglobulins and T cell receptors; lymphocyte development, immune regulation, immunological diseases, tumor immunity. Prerequisites: BCH/BIO 250 and BIO 198 or equivalent. BIO 202 is also recommended. (Fall)

NEUROSCIENCE

COMMITTEE ON NEUROSCIENCE

Gregory DeAngelis, Ph.D. (California, Berkeley) *Professor of Brain and Cognitive Sciences, of Biomedical Engineering, of Neurobiology and Anatomy, and in the Center for Visual Science*

Carol K. Kellogg, Ph.D. (Rochester) *Profes-sor of Brain and Cognitive Sciences and of Psychology*

Ernest J. Nordeen, Ph.D. (California, Irvine) *Professor of Brain and Cognitive Sciences, of Psychology, and of Neurobiology and Anatomy*

Kathy W. Nordeen, Ph.D. (California, Irvine) *Professor of Brain and Cognitive Sciences, of Psychology, and of Neurobiology and Anatomy*

William E. O'Neill, Ph.D. (SUNY, Stony Brook) *Associate Professor of Neurobiology and Anatomy and of Brain and Cognitive*

Sciences

Alexandre Pouget, Ph.D. (California, San Diego) *Associate Professor of Brain and Cognitive Sciences and in the Center for Visual Science*

Raphael Pinaud, Ph.D. (Oregon Health & Science University) *Assistant Professor of Brain and Cognitive Sciences, and in the Center for Visual Science*

David Holtzman, Ph.D. (SUNY Health Science, Brooklyn) *Senior Lecturer, Brain and Cognitive Sciences*

Biological systems are composed of a variety of cell types, each performing highly specialized tasks. Neuroscience adopts a multidisciplinary approach to the study of nervous systems, and endeavors to understand how cells of this organ system function to generate and regulate behavior. Nerve cells perform some of the most complex tasks of the body, imparting behavioral and physiological individuality to an organism. Accordingly, some of the most debilitating diseases known are associated with a failure in the function of these cells.

Neuroscience at the University of Rochester was established in 1973 as an interdepartmental concentration undergraduate degree program and was initiated by student interest. It integrates fields as diverse as anatomy, biochemistry, biology, physiology, and psychology, and is one of only a few undergraduate programs in neuroscience available in the United States. Neuroscience majors gain a solid background in biology, chemistry, physics, and mathematics, along with a concentration of courses in neuroscience. As one of the B.S. tracks in the University's Undergraduate Program in Biology and Medicine (UPBM), it draws upon the collective strengths of several departments on the River Campus and at the Medical Center.

REQUIREMENTS FOR THE B.S. IN BIOLOGICAL SCIENCES: NEUROSCIENCE

- Introductory Courses—Three (14 credits). BIO 110 or 112, 111 and 111L or 113 and 113L, and either 198, 250, or 210 (juniors and seniors only). The laboratory section associated with 198 is optional for the neuroscience concentration but is highly recommended.
- Required Neuroscience Core Courses—Five and three fourths (23 credits). NSC 201 and 201L, 203 (it is recommended that this course be taken before the senior year), either 301 or 302, and three electives chosen from the following list: at least one from Group A—NSC 243, 248, 249, 512,* IND 447*—at least one course from Group B—NSC 221, 244, 245. The third elective may be from Group A, B, or C—NSC 242, 246, 508,* BCS 547.*
- Elective/Diversification—Two courses (8 credits). These courses must be from out-side the neuroscience curriculum and are to be selected from those courses offered through the Undergraduate Program in Biology and Medicine and must be approved by a neuroscience advisor.
- Allied Fields
  1. Four semesters of chemistry (two general and two organic courses) with lab.
  2. Two semesters of calculus.
  3. Two semesters of calculus-based physics (PHY 113, 114 or PHY 121, 122) with lab.
  4. BCS 200 and 200L (Statistical Analysis and Experimental Design with lab). Must be taken before enrolling in NSC 203. STT 212 *plus* BCS 200L may be taken in place of BCS 200; however, this is not recommended.

TYPICAL NEUROSCIENCE PROGRAM

First Year

BIO 110/112	BIO 111/113	
CHM 131	CHM 132	
Writing	MTH 142/162	
MTH 141/161	Elective	

Second Year

NSC 201	NSC 203	
NSC 201L (1 cr.)	BIO elective	
CHM 203, 207	CHM 204, 208	
BCS 200	Elective	Elective

Third Year

Physics 113	BIO elective
NSC elective	NSC elective

Elective	Physics 114
Elective	Elective

Fourth Year

NSC elective	BIO elective
Elective	NSC 302 (2 cr.)
Elective	Elective
Elective	Elective
	Elective

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings. For fuller descriptions and up-to-date schedules see the program's Web page, www.bcs.rochester.edu/neuro/.

201. Basic Neurobiology. Explores fundamental concepts of neural organization and function. Covers gross and cellular neuroanatomy, neuronal cell biology, the electrophysiology of neurons and synapses, neurochemistry, spinal circuitry, sensory and motor systems, and higher functions including learning and memory. Prerequisites: BIO 110 or 112 and 111 and 111L or 113 and 113L. (Fall)

201L. Basic Neurobiology Lab. Credit—1 hour. Designed to be taken concurrently with NSC 201, Basic Neurobiology. Five laboratory sessions reinforce concepts introduced in NSC 201. Each session lasts approximately two hours. NSC 201L is a prerequisite for the upper-level neurobiology laboratory course, NSC 203. (Fall)

203. Laboratory in Neurobiology. Introduces the various methods used in neurobiological research. Covers anatomical, molecular, behavioral, and physiological approaches to studying neural organization and function and concludes with a research project that extends over a period of five weeks. Prerequisites: BCS 200 and 200L and NSC 201 and 201L. (Spring)

221. Audition. An examination of the physiological substrate responsible for hearing. Topics include the physical stimulus for hearing, receptive aspects of speech and language, overview of peripheral physiology (the outer and middle ears, cochlea, and auditory nerve), and central aspects of auditory physiology (brainstem nuclei, auditory cortex, descending systems). Introduces the electro-physiological techniques used to study auditory function, and explores sensory and perceptual correlates of physiology and sensorineural hearing loss. Prerequisite: BCS 110 or NSC 201 or equivalent background. (Spring)

242. Neuropsychology. This course introduces students to the field of clinical neuropsychology, which bridges the domains of neurology, neuroscience, and clinical psychology. It begins with a general overview and history of clinical neuropsychology. Then, principles of neuropsychological assessment and the interpretation of cognitive and behavioral findings as they relate directly to brain dysfunction are discussed. The remainder of the course is "syndrome" oriented and focuses on specific neurological syndromes including: neurodegenerative disorders, cerebrovascular disorders, memory disorders, epilepsy, head trauma, toxic disorders, infectious processes, pediatric neuropsychology, psychiatric syndromes, and forensic neuropsychology. Prerequisite: BCS 110 or BCS 240 (NSC 201) or permission of the instructor. (Spring)

243. Neurochemical Foundations of Behavior. An introduction to the field of neurochemistry with an emphasis on cellular and molecular neurochemistry. Topics range from study of neurochemical mechanisms that underlie normal neural function to discussion of behavioral disturbances that result from neurochemical abnormalities. Considers specific functional issues such as neurochemical mechanisms of adaptive behavior, learning and memory, behavioral disorders, gender differences, and drug-seeking behavior. Prerequisite: NSC 201; an introductory knowledge of biochemistry is recommended. (Fall)

244. Neuroethology. Explores the neural basis of naturally occurring animal behaviors. Emphasizes how information is integrated from interactions between molecules, cells, and groups of cells, all of which are necessary to produce behavior. Considers how hormones, neural development, anatomy, physiology, and evolution lead to behaviors such as orientation, communication, feeding, and reproduction. Prerequisite: NSC 201 or permission of instructor. (Spring)

245. Sensory and Motor Neuroscience. Provides an overview of the neural basis of perception and action, covering vision, audition, somatosensation, chemical senses, eye movements, and reaching. Topics include a review of sensory transduction, how the brain extracts information from sensory signals, how muscles convert nerve impulses into mechanical forces, how different movements are encoded in the brain, and how an animal's internal state (e.g., memory or attention) influences the course of action. Prerequisite: NSC 201, or equivalent background with instructor's permission. (Spring)

246. Biology of Mental Disorders. Examines the neurobiology of anxiety/phobic conditions, mood disorders, and chronic psychotic states, particularly schizophrenia. Considers definitions of psychiatric syndromes, the problems of diagnosis, brain organization, and neurotransmitter systems involved in "state" functions. Introduces research approaches including epidemiologic, phenomenologic, family/adoption, longitudinal descriptive, psychophysiologic, neuropharmacologic, genetic linkage, and postmortem studies; emphasizes recent in vivo brain imaging and neuroreceptor studies. Prerequisite: BCS 110 or NSC 201 or permission of the instructor. (Fall)

248. Neurobiology of Learning and Memory. Provides a basic overview of the neural basis of learning and memory formation,

with a focus on the acquisition of simple associations and complex memories and skills. Considers how neurons and neuronal ensembles encode, consolidate, store, and retrieve specific memories. Although emphasis is on the anatomical, molecular, and cellular levels, findings obtained from the perspective of systems and cognitive neuroscience are also considered. Prerequisite: NSC 201 or equivalent background. (Fall)

249. Developmental Neurobiology. Advanced treatment of the development of the nervous system, including the nature/nurture issue and factors that influence the development of neural organization and function. Topics include the production, migration, differentiation, and survival of neurons; functional specialization of neural regions; axonal navigation; target mapping. Compares and contrasts developmental plasticity with forms of neural plasticity exhibited in adults. Prerequisite: NSC 201 or equivalent background. (Spring)

301/302. Senior Seminar in Neuroscience. To be taken for one semester in the senior year. Format can vary from an emphasis on exploring neuroscience as a scientific career, to more thematically based seminars dealing with recent research in neuroscience. Oral and written presentation skills are sharpened through a series of student-led presentations on current issues or topics in neuroscience, as well as a series of short reports. (Fall, Spring)

Undergraduates who wish to enroll in
graduate-level neuroscience courses must be declared concentrators in their senior year and have consulted their faculty advisor as well as the course instructor(s) for permission.

Further information on the undergraduate program as well as the 4-1 B.S./M.S. program is available from the Undergraduate Neuroscience Program office, 102 Meliora Hall, and from Professor Ernie Nordeen, Neuroscience Track Coordinator, in the Department of Brain and Cognitive Sciences, 116 Meliora Hall. Also consult our Web page at www.bcs.rochester.edu/neuro.

BRAIN AND COGNITIVE SCIENCES

James F. Allen, Ph.D. (Toronto) *John H. Dessauer Professor of Computer Science and Professor of Brain and Cognitive Sciences and of Linguistics*

Richard N. Aslin, Ph.D. (Minnesota) *William R. Kenan Profes-sor, Professor of Brain and Cognitive Sciences, of Psychology, and in the Center for Visual Science; Director, Rochester Center for Brain Imaging*

Daphne Bavelier, Ph.D. (M.I.T.) *Professor of Brain and Cognitive Sciences, of Imaging Sciences, and in the Center for Visual Science*

Gregory N. Carlson, Ph.D. (Massachusetts) *Pro-fes-sor of Linguistics, of Brain and Cognitive Sciences, and of Philosophy*

Robert M. Chapman, Ph.D. (Brown) *Pro-fes-sor of Brain and Cognitive Sciences, of Psychology, and in the Center for Visual Science*

Gregory DeAngelis, Ph.D. (California, Berkeley)
Professor of Brain and Cognitive Sciences, of Biomedical Engineering, of Neurobiology and Anatomy, and in the Center for Visual Science

Charles J. Duffy, Ph.D. (Johns Hopkins) *Professor of Neurology, of Neurobiology and Anatomy, of Ophthalmology, of Brain and Cognitive Sciences, and in the Center for Visual Science*

James R. Ison, Ph.D. (Michigan) *Professor of Brain and Cognitive Sciences, of Psychology, and in the Center for Visual Science*

Suzanne Haber, Ph.D. (Stanford) *Professor of Pharmacology and Physiology, of Neurobiology and Anatomy, of Neurology, and of Brain and Cognitive Sciences*

Robert A. Jacobs, Ph.D. (Massachusetts)
Professor of Brain and Cognitive Sciences, of Psychology, of Computer Science, and in the Center for Visual Science

Carol K. Kellogg, Ph.D. (Rochester) *Professor of B--rain and Cognitive Sciences and of Psychology*

Rafael Klorman, Ph.D. (Wisconsin) *Professor of Psychology and of Brain and Cognitive Sciences*

David C. Knill, Ph.D. (Brown) *Professor of Brain and Cognitive Sciences, of Computer Science, and in the Center for Visual Science; Associate Director of the Center for Visual Science*

Ralph W. Kuncl, M.D. (Chicago) *Professor of Neurology and of Brain and Cognitive Sciences*

Peter Lennie, Ph.D. (Cambridge) *Professor of Brain and Cognitive Sciences and in the Center for Visual Science*

Walter Makous, Ph.D. (Brown) *Professor of Brain and Cognitive Sciences, of Psychology, of Ophthalmology, and in the Center for Visual Science*

Elizabeth W. Marvin, Ph.D. (Eastman) *Professor of Music Theory in the Eastman School of Music and of Brain and Cognitive Sciences*

William H. Merigan, Ph.D. (Maryland) *Pro-fes-sor of Ophthalmology, of Environmental Medicine, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Elissa Newport, Ph.D. (Pennsylvania) *George Eastman Professor of Brain and Cog-nitive Sciences and Professor of Psychology; Chair of Department*

Ernest J. Nordeen, Ph.D. (California, Irvine) *Professor of Brain and Cognitive Sciences, of Psychology, and of Neurobiology and Anatomy*

Kathy W. Nordeen, Ph.D. (California, Irvine) *Professor of Brain and Cognitive Sciences, of Psychology, and of Neurobiology and Anatomy*

Gary D. Paige, Ph.D. (Chicago) *Kilian J. and Caroline F. Schmitt Professor of Neurobiology and Anatomy, Professor of Neurology, of Ophthalmology, of Biomedical Engineering, of Surgery, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Tatiana Pasternak, Ph.D. (Copenhagen*)*
Pro-fessor of Neurobiology and Anatomy, of Brain and Cognitive Sciences, and in the Center for Visual Science

Marc Schieber, M.D. (Washington University, St. Louis) *Professor of Neurology, of Neurobiology and Anatomy, of Physical Medicine and Rehabilitation, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Michael K. Tanenhaus, Ph.D. (Columbia)
Beverly Petterson Bishop and Charles W. Bishop Professor, Professor of Brain and Cognitive Sciences and of Psychology

David R. Williams, Ph.D. (California, San Diego) *William G. Allyn Professor of Medical Optics, Professor of Optics, of Brain and Cognitive Sciences, of Psychology, of Biomedical Engineering, of Ophthalmology, and in the Center for Visual Science; Director of the Center for Visual Science*

Loisa Bennetto, Ph.D. (Denver) *Associate Professor of Psychology and of Brain and Cognitive Sciences*

Peter Como, Ph.D. (Delaware) *Associate Professor of Neurology, of Psychiatry (Neuropsychology), and of Brain and Cognitive Sciences*

Krystel Huxlin, Ph.D. (Sydney) *Associate Professor of Ophthalmology, of Neurobiology and Anatomy, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Joyce McDonough, Ph.D. (Massachusetts)
Associate Professor of Linguistics and of Brain and Cognitive Sciences

Jonathan W. Mink, M.D. (Washington University) *Associate Professor of Neurology, of Neurobiology and Anatomy, of Pediatrics, and of Brain and Cognitive Sciences*

William E. O'Neill, Ph.D. (SUNY, Stony Brook) *Asso-ciate Pro-fessor of Neurobiology and Anatomy and of Brain and Cognitive Sciences*

Alexandre Pouget, Ph.D. (California, San Diego) *Associate Professor of Brain and Cognitive Sciences and in the Center for Visual Science*

Jeffrey Runner, Ph.D. (Massachusetts, Amherst) *Associate Professor of Linguistics and of Brain and Cognitive Sciences*

Ted Supalla, Ph.D. (California, San Diego) *Associate Professor of Brain and Cognitive Sciences and of Linguistics; Director, American Sign Language Program*

Jessica Cantlon, Ph.D. (Duke) *Assistant Professor of Brain and Cognitive Sciences*

Christine Gunlogson, Ph.D. (California, Santa Cruz) *Assistant Professor of Linguistics and of Brain and Cognitive Sciences*

T. Florian Jaeger, Ph.D. (Stanford) *Assistant Professor of Brain and Cognitive Sciences and of Computer Science*

Raphael Pinaud, Ph.D. (Oregon Health & Science University) *Assistant Professor of Brain and Cognitive Sciences, and in the Center for Visual Science*

Duje Tadin, Ph.D. (Vanderbilt) *Assistant Professor of Brain and Cognitive Sciences, and in the Center for Visual Science*

Matt Dye, Ph.D. (Southampton) *Research Associate, Brain and Cognitive Sciences*

David Holtzman, Ph.D. (SUNY Health Science, Brooklyn) *Senior Lecturer, Brain and Cognitive Sciences*

The Department of Brain and Cognitive
Sciences represents a new academic discipline that integrates biological, behavioral, and computational methods to study perception, cognition, and action and the brain activity that underlies them. Faculty and students in the department study how we see and hear, move, learn and remember, reason, produce and understand spoken and signed languages, and how these remarkable capabilities depend upon the workings of the brain. They also study how these abilities develop, and how the brain matures to become able to organize such complex behavior.

The programs in the Department of Brain and Cognitive Sciences (BCS) offer rigorous but accessible natural science concentrations for students interested in how we perceive, think, and learn, and what brain mechanisms make these abilities possible. The programs have two aims: (1) to provide sound intellectual trainingin an analytic science that will
benefit students in a wide range of career paths; and (2) to provide a strong background for students contemplating graduate or professional training in the behavioral and neural sciences. The curricula provide excellent routes to learn the logic and methods of scientific inquiry and how to reason critically, and provide unique opportunities to engage in research problems at the frontiers of knowledge.

The B.A. curriculum consists of two foundation courses; three core courses built on these foundations; a statistics course; a laboratory course; four upper-level electives organized around a theme chosen by each student; and a senior seminar.

The B.S. curriculum includes all the requirements for the B.A. degree in BCS, and also incorporates foundational and advanced work in related allied fields, including biology, computer science, math, and symbolic systems.

There is no requirement to undertake a research project, but students are encouraged to take advantage of the many research opportunities available in the department. All of the faculty in brain and cognitive sciences have active research programs, and qualified undergraduates can participate directly in scientific discovery through independent research courses and the honors program (see page 43).

In addition to the B.A. and B.S. in brain and cognitive sciences, the department administers the curriculum leading to a B.S. in biological sciences with specialization in neuroscience, offered through the Undergraduate Program in Biology and Medicine (see page 32). Also, in cooperation with the Department of Clinical and Social Sciences in Psychology, the department provides a curriculum leading to a B.A. in psychology (see page 121). Further information can be obtained from the Department of Brain and Cognitive Sciences Web pages (www.bcs.rochester.edu) or the department's Undergraduate Programs Office, 102 Meliora Hall, (585) 275-0541.

The department also offers a minor and a number of clusters (see below) that provide an introduction to the field and allow students freedom to pursue topics of special interest.

UNDERGRADUATE ORGANIZATIONS

The Department of Brain and Cognitive Sciences supports an undergraduate council for students interested in the discipline. The council organizes trips to conferences, brings in guest speakers, organizes faculty/student mixers, promotes the brain and cognitive sciences major, and holds office hours for undergraduates interested in tutoring. Additional information about this organization is available on the department's Web pages.

REQUIREMENTS FOR THE B.A. IN BRAIN AND COGNITIVE SCIENCES

The B.A. program provides introductory background to all areas of brain and cognitive sciences and encourages deep exploration of one subfield within BCS. It differs from the B.S. in that it requires fewer courses and thus allows greater flexibility in overall program planning. The B.A. program is particularly suitable for students with focused interests in a single area of BCS and those wishing to pursue double degrees or double majors. The concentration consists of 12 courses.

- Two foundation courses (BCS 110 and 111) provide a general introduction to the field; one examines the neural machinery that underlies behavior, and the other introduces the domain of cognitive science.
- Three core courses (BCS 151, 152, 153) build on the foundation courses by providing a fuller exploration of the major scientific problems we study—perception and action, language, and cognition.
- A statistics course (BCS 200) and a laboratory course (BCS 203, 204, 205, or 208) introduce the fundamentals of experimental design and analysis, and provide hands-on experience with how we acquire knowledge about the brain and behavior. The brain and cognitive sciences draw on a wide variety of scientific methods, and students can choose from among laboratory courses that emphasize different techniques. All courses stress analytical thinking and technical writing and provide a solid grounding for students to undertake major research projects.
- Depth of knowledge is achieved through four upper-level electives. At least three must be 200-level courses, and three of the four should form a coherent "track" around some theme within BCS. The department offers examples of common track themes (see below), but students can form their own tracks in consultation with their advisor and with the approval of the director of undergraduate studies.
- Students complete their degree with the Senior Seminar (BCS 310 or 311), a 2-credit course that focuses on reading, evaluating, and discussing primary research papers and writing an evaluation of papers as though providing peer review for a journal. The course also includes discussions of the work of visiting speakers. Honors students enroll in BCS 311 and write and present a senior thesis.

Sample track themes:

Neuropsychology and Mental Disorders

BCS 240. Basic Neurobiology
BCS 242. Neuropsychology
BCS 243. Neurochemical Foundations of Behavior
BCS 246. Biology of Mental Disorders
BCS 248. Neurobiology of Learning and Memory
BCS 265. Language and the Brain

Psycholinguistics
LIN 110. Introduction to Linguistic Analysis
BCS 172. Development of Mind and Brain
BCS 259. Language Development
BCS 261. Language Use and Understanding
BCS 264. Signed Language Structure
BCS 265. Language and the Brain

Perception and Action
BCS 220. The Intelligent Eye
BCS 221. Audition
BCS 245. Sensory and Motor Neuroscience

Computation and Cognition
This track is undergoing modifications: interested students should consult an advisor.

Development
BCS 172. Development of Mind and Brain
BCS 240. Basic Neurobiology
BCS 249. Developmental Neurobiology
BCS 259. Language Development

Music and Language Cognition
BCS 260. Music and the Mind
BCS 221. Audition
BCS 259. Language Development
BCS 261. Language Use and Understanding
BCS 265. Language and the Brain

Speech and Hearing*
LIN 110. Introduction to Linguistic Analysis
BCS 221. Audition
BCS 259. Language Development
BCS 261. Language Use and Understanding
BCS 264. Signed Language Structure
BCS 265. Language and the Brain

REQUIREMENTS FOR THE B.S. IN BRAIN AND COGNITIVE SCIENCES

The B.S. program provides a broad and rigorous natural science education that prepares students for postgraduate work in BCS and related fields (e.g., cognitive science, cognitive neuroscience, computational modeling). In addition to BCS courses, the curriculum entails a foundation in math, biology, computer programming, and symbolic systems so as to prepare students for all advanced courses within our discipline. The B.S. concentration consists of 20 courses.

General Science Foundation Courses *(four courses required)*
One cell biology (BIO 110)
One calculus (MTH 161 recommended or MTH 141 acceptable)
One symbolic systems (LIN 110, CSC 173, CSC/PHL 217, CSC 240, or 242)

One computer programming (ECE 114, CSC 170, or 171)

All of the B.A. Requirements *(12 courses, see descriptions above)*
Two BCS foundations courses (BCS 110, 111)
Three BCS core courses (BCS 151, 152, 153)
One statistics course (BCS 200)
One laboratory course (BCS 203 or 204 or 205 or 208)
Four upper-level electives
One senior seminar (BCS 310)

Allied Field Electives *(two courses)*
These electives can be chosen from the list of approved allied field courses in mathematics, computer science, biology, chemistry, physics, philosophy, music theory, linguistics, optics, or engineering. They should be chosen, in consultation with a faculty advisor, to relate to the track theme formed by the BCS electives.

Open Electives *(two courses)*
These can be BCS or approved allied field elective courses.

Sample track themes:

Artificial Intelligence/Computation
The track in artificial intelligence and computation focuses on the design of computer simulations that mimic how people create and manipulate mental and neural representations. A variety of topics can be explored within the context of this track, including the use of mental and neural representations for the purposes of sensory perception, motor action, linguistic communication, and reasoning and decision making. To support these topics of interest, allied field electives typically are chosen from computer science and mathematics. This track is particularly suitable for students interested in pursuing advanced degrees in cognitive science, computational neuroscience, or artificial intelligence.

Language
The track in language focuses on how people produce and understand spoken and signed languages and how children learn language. A variety of topics can be explored within the context of this track, including the perception and production of speech, the development of language in children, natural language processing, the formal structure of language and computer models of language. To support these topics of interest, allied field electives typically are chosen from linguistics, computer science, and philosophy. This track is particularly suitable for students interested in pursuing advanced degrees in cognitive science, psycholinguistics, linguistics, and computational linguistics, or in more applied fields such as speech sciences and communication disorders.

Neurobiology
The track in neurobiology focuses on the biology of the nervous system with special emphasis on biological mechanisms of cognitive behavior. A variety of topics can be explored within the context of this track, including the physiological foundations of sensory perception and motor behavior, relationships between brain dysfunction and cognitive/behavioral deficits, and the cellular and molecular processes that influence the development of brain and behavior. To support these topics of interest, allied field electives typically are chosen from biology or chemistry. This track is particularly suitable for students interested in pursuing advanced degrees in neuroscience, neuropsychology, or medicine.

Perception and Action
The track in perception and action focuses on sensory systems and how humans and animals use sensory information to perceive the world and guide actions. Topics that can be studied in this track include how our eyes, ears, and other sensory organs work, how the brain interprets information from the senses for perception and action, and how to construct artificial sensory and robotic systems. To support these topics of interest, allied field electives typically are chosen from biology, physics, mathematics, and computer science. This track is well suited for students interested in pursuing advanced degrees in cognitive science, vision science, neuroscience, or artificial intelligence or more applied degrees in fields such as physical therapy, optometry, or audiology.

HONORS PROGRAM IN BRAIN AND COGNITIVE SCIENCES

Faculty in the department have active research programs and strongly encourage undergraduates to become engaged in research projects. A research project fosters independent thinking, encourages teamwork, and prepares a student well for postgraduate employment and advanced degree programs. Students wishing to make a substantial investment in re-search may do so through the honors re-search program. Generally, this program is begun before the end of the junior year after completion of at least one semester of independent research. Students who intend to participate in the honors research program should notify the Undergraduate Pro-

gram secretary of this intent as soon as possible and no later than the end of the fall semester of their senior year. A degree with Honors in Research is awarded to students who successfully complete the following additional requirements:

1. Maintain a 3.3 GPA in BCS courses.

2. Complete two semesters of independent research with the thesis advisor. The final semester should be registered as Honors Research (BCS 396).

3. Before enrolling in honors research, submit a three-page thesis proposal to an advisory committee consisting of the thesis advisor and one other faculty member in the department. At the same time, register a copy of this proposal in the BCS Undergraduate Program Office (102 Meliora Hall). The thesis proposal should pre-sent the background and rationale for the research, explain why the work undertaken is important, and outline the methods used to address the problem and the timeframe es-timated to complete the work. The thesis proposal should be reviewed by the advisory committee no later than the end of the fall semester of the senior year. Students wishing to work with an advisor in an affiliated program must obtain prior approval from the department's Committee on Undergraduate Studies.

4. Submit the title of the thesis and endorsing signatures from the advisory committee to the Undergraduate Program Office (102 Meliora Hall) no later than the second week of the semester in which the Senior Seminar is taken. Honors students enroll in the Honors Senior Seminar (BCS 311).

5. Prepare a written senior thesis in the form of a scientific journal article and present the thesis orally as part of the Senior Seminar. The written thesis must be submitted to the
advisory committee no later than April 15 of the graduating year.

6. The thesis is presented formally in a public seminar and then defended at a closed meeting of the student's advisory committee with an additional faculty member chosen by the departmental chair.

MINOR IN BRAIN AND COGNITIVE SCIENCES

Students can build a six-course minor in brain and cognitive sciences. All minors are based on the two foundation courses that provide an integrated introduction to the field; these are augmented by at least two of the three core courses that provide a thorough treatment of one of the major problems we study (perception and action, language, and cognition). Additional electives allow students freedom to explore the field broadly or to specialize somewhat.

- Two foundation courses
  BCS 110. Neural Foundations of Behavior
  BCS 111. Foundations of Cognitive Science
- At least two of the following core courses:
  BCS 151. Perception and Action
  BCS 152. Language and Psycholinguistics
  BCS 153. Cognition
- One or two electives, at least one of which is numbered 200 or above (students who take only two core courses must take two electives). Elective(s) must either form a progression with the core course(s), be a methods course, or an associated laboratory course.

The department offers a broad range of elective courses on such topics as language, perception, development, or behavioral neuroscience. *No more than two courses may be counted for credit towards both the major and minor requirements.*

RELATED MINORS

Minor in Psychology as a Natural Science

See the Department of Clinical and Social Psychology.

Minor in Visual Science and
Research Minor in Visual Science

See Center for Visual Science.

CLUSTERS

Students can satisfy the College's distribution requirements for *natural science* courses by completing one of the department's nine clusters. Because we offer a range of courses at introductory, intermediate, and advanced levels, students can form clusters in different ways, choosing to emphasize breadth or depth. All clusters offered by the department require at least one foundation course followed by one intermediate course.

Mind and Brain

(Because of "overlap" rules, this cluster is not available to most psychology majors.)

A general introduction to perception, cognition, learning, memory, and development, considering both the nature of these proc-esses

and the brain mechanisms that underlie them.
BCS 110. Neural Foundations of Behavior
and
BCS 111. Foundations of Cognitive Science
or
BCS 112. Cognitive Psychology*
and
Choose *one*:
BCS 151. Perception and Action
BCS 152. Language and Psycholinguistics
BCS 153. Cognition

Language and Cognition
An introduction to the mental processes involved in human language and cognition. Choose *three*:
BCS 111. Foundations of Cognitive Science
or
BCS 112. Cognitive Psychology*
BCS 152. Language and Psycholinguistics
BCS 153. Cognition
BCS 172. Development of Mind and Brain
BCS 183. Animal Minds
BCS 259. Language Development
BCS 261. Language Use and Understanding
BCS 264. Signed Language Structure
BCS 265. Language and the Brain

The Senses
An introduction to the human senses, particularly vision and hearing, covering both the basic sensory processes and higher-level perceptual ones.
BCS 110. Neural Foundations of Behavior
BCS 151. Perception and Action
and
Choose *one*:
BCS 220. The Intelligent Eye
BCS 221. Audition
BCS 245. Sensory and Motor Neuroscience

Mind, Brain, and Development
(Because of "overlap" rules, this cluster is not available to most psychology majors.)
An introduction to the brain and cognitive processes, with a special emphasis on their development.
BCS 110. Neural Foundations of Behavior
BCS 111. Foundations of Cognitive Science
or
BCS 112. Cognitive Psychology*
BCS 172. Development of Mind and Brain

Perception and Development
An introduction to perception, cognition, their development, and their underlying brain mechanisms.
Choose *one*:
BCS 110. Neural Foundations of Behavior
BCS 111. Foundations of Cognitive Science
BCS 112. Cognitive Psychology
and
BCS 151. Perception and Action
BCS 172. Development of Mind and Brain

Language and Cognitive Development
An introduction to the development of language and cognition and their underlying biological mechanisms.
BCS 110. Neural Foundations of Behavior
BCS 172. Development of Mind and Brain
BCS 259. Language Development

Biology and Behavior
An introduction to animal behavior and its underlying biological and evolutionary mechanisms.
BCS 110. Neural Foundations of Behavior
BCS 183. Animal Minds
BCS 244. Neuroethology
BIO 260. Animal Behavior

Neurobiology
An introduction to the biology of the brain and the neural mechanisms underlying behavior.
BIO 110. Principles of Biology I
or
BIO 112. Perspectives in Biology I
BCS 240. Basic Neurobiology
and
Choose *one*:
BCS 221. Audition
BCS 242. Neuropsychology
BCS 243. Neurochemical Foundations of Behavior
BCS 244. Neuroethology
BCS 245. Sensory and Motor Neuroscience
BCS 246. The Biology of Mental Disorders
BCS 248. Neurobiology of Learning and Memory
BCS 249. Developmental Neurobiology

Neuropsychology
An introduction to the biological mechanisms that underlie behavior with special emphasis on abnormal behavior.
BCS 110. Neural Foundations of Behavior
BCS 242. Neuropsychology
BCS 246. The Biology of Mental Disorders

UPPER-LEVEL WRITING REQUIREMENT

Successful completion of a BCS degree will also satisfy the College upper-level writing requirement through significant writing experience at three levels of the curriculum: core courses, laboratory course, and Senior Seminar.

COURSES OF INSTRUCTION

*Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. See the department's Web pages for fuller descriptions and up-to-date schedules (*www.bcs.rochester.edu*).*

110. Neural Foundations of Behavior. Introduces the structure and organization of the brain, and its role in perception, movement, thinking, and other behavior. Topics include the brain as a special kind of computer, localization of function, effects of brain damage and disorders, differences between human and animal brains, sex differences, perception and control of movement, sleep, regulation of body states and emotions, and development and aging. No prerequisites. (Fall)

111. Foundations of Cognitive Science. Introduces the organization of mental proc-esses underlying cognition and behavior. Topics include perception, language processing, learning, and memory. Integrates knowledge of cognition generated from the fields of cognitive psychology, artificial intelligence, neuroscience, linguistics, and philosophy. No prerequisites. (Fall and Spring)

112. Cognitive Psychology. Provides an introduction to basic concepts in modern cog-nitive psychology. Topics covered include pattern recognition, attention and memory, concepts and categories, language comprehension and production, and higher-level thinking, such as reasoning and decision making. No prerequisites. (Spring)

151. Perception and Action. Explores how the biology of our senses shapes perceptual experiences of reality. Emphasizes sense of sight primarily and hearing secondarily. An important theme is that our sensory systems play a crucial role in the execution of coordinated movements of our bodies, as we navigate in, and interact with, the environment. Prerequisites: BCS 110 *or* 111, or

equivalent background. (Fall)

152. Language and Psycholin-guistics. An overview of the nature and processing of human languages, including com--parisons between language and animal communication systems, the biological bases of human language, and the cognitive mech-an-isms used in producing, understanding, and learning language. Prerequisites: BCS 110 or 111 or 112; or LIN 110. (Fall)

153. Cognition. Considers human cognitive processes, including behavioral and computational methods used to understand the nature of cognition. Explores how we perceive and integrate sensory information to build a coherent perception of the world; how we memorize and retrieve information; how we reason and solve problems. Prerequisite: BCS 110; BCS 111 recommended. (Spring)

172. Development of Mind and Brain. Introduces human development, focusing on the ability to perceive objects and sounds, to think and reason, and to learn and remember language and other significant patterned stimulation. Includes the nature and mechanisms of development in humans and an overview of what is known about brain and behavioral development in other species. No prerequisites. (Spring)

183. Animal Minds. Considers the cognitive and communicative abilities of animals, especially primates, as compared with humans. Topics include thinking, reasoning, remembering, communicating, and understanding number, time, and causality, in animals ranging from ants to apes. No prerequisites. (Fall)

200. Statistical Analysis and Experimental Design with Lab. Introduces statistical methods including descriptive statistics (count, central tendency, dispersion), hypothesis testing (significance, t-test, chi-square, etc.) and elements of correlation, regression, and interaction. Emphasis is on what a technique does at a conceptual level, how a technique is reported in the lit--erature, and how to execute a technique. No prerequisites. (Fall)

203. Laboratory in Neurobiology. Introduces the various methods used in neurobiological research. Covers anatomical, behavioral, molecular, and physiological approaches to studying neural organization and function and concludes with a research project that extends over a period of five weeks. Prerequisite: BCS 200, 240, and 240L, or equivalent background with permission of instructor. Same as NSC 203. (Spring)

204. Laboratory in Cognitive Neuroscience. Introduces methods used in cognitive neuroscience, a field that examines cognitive phenomena in terms of their underpinnings in the brain. Covers functional anatomical approaches to studying brain function and dysfunction, behavioral and brain imaging approaches to studying learning and memory, and neuropsychological approaches to understanding sensory, motor, and cognitive processing and disorders. Prerequisite: BCS 200 *and* BCS 153. (Fall)

205. Laboratory in Development and Learning. Introduces behavioral methods used to study the development of perception, cognition, and language and provides hands-on experience in the testing of human infants and children. Includes two research projects and a final PowerPoint presentation. Prerequisites: BCS 200 *and* one of the BCS core courses (151, 152, 153) or BCS 172, or equivalent background. (Fall)

208. Laboratory in Perception and Cognition. Introduces behavioral and psychophysical studies of perceptual and cognitive phenomena. Students perform, analyze, interpret, and report results from experiments that move from reproducing classic phenomena to conducting new studies independently. Prerequisites: BCS 200 *and* either BCS 151 or 153. (Spring)

220. The Intelligent Eye. Provides an interdisciplinary view of modern research into how the human brain solves the problems involved in perception, including how we perceive the three-dimensional structure of the world, how we recognize objects and how visual information is used to control action in the world. Students read contemporary research and, through classroom discussion and critical essays, explore and analyze the questions and debates that define contemporary perceptual science. Prerequisite: BCS 151. (Spring)

221. Audition. Examines the physiological substrate responsible for hearing. Topics include the physical stimulus for hearing, receptive aspects of speech and language, peripheral physiology (the outer and middle ears, cochlea, and auditory nerve), and central physiology (brainstem nuclei, auditory cortex, descending systems). Introduces electrophysiological techniques used to study auditory function, and explores sensory and perceptual correlates of physiology and sensorineural hearing loss. Prerequisite: BCS 110 or equivalent background. (Spring)

232. Artificial Intelligence. Computer representations of facts, temporal phenomena, beliefs, physical processes, and space. Applications include planning, natural language, computer vision (physics-based vision, texture, motion, active vision), and robotics (coordinates kinematics, dynamics, control, architectures, mobile robotics laboratory). LISP, C++, and possibly MATLAB programming. Laboratory exercises involve state-of-the-art hardware and software systems. Same as CSC 242. Prerequisites: PHL 110 and CSC 172. (Spring)

233. Statistical Speech and Language Processing. An introduction to statistical natural language processing and automatic speech recognition techniques. This course presents the theory and practice b-e--hind the recently developed language proc-essing technologies that enable applications such as speech-driven dictation systems, document search engines (e.g., finding Web pages) and automatic machine translation. Prerequisites: CSC 172 and either CSC 240 or 242. Same as CSC 248. (Fall, odd-numbered years)

235. Natural Language Processing. Introduces natural language processing: constructing computer programs that understand natural language. Topics include parsing, semantic analysis, and knowledge representation. Same as CSC 247. Prerequisite: BCS

232 (CSC 242). (Fall, even-numbered years)

236. Machine Vision. Introduces computer vision, including model-based vision, projective invariance, Hough transforms, pattern recognition and neural nets, color theory, texture, and optic flow. Prerequisite: BCS 232 (CSC 242). Same as CSC 249. (Fall)

240. Basic Neurobiology. Explores fundamental concepts of neural organization and function. Covers gross and cellular neuroanatomy, neuronal cell biology, the electrophysiology of neurons and synapses, neurochemistry, spinal circuitry, sensory and motor systems, and higher functions including learning and memory. Prerequisites: BIO 110 or 112 and 111 and 111L or 113 and 113L. Same as NSC 201. (Fall)

240L. Basic Neurobiology Lab. Credit—1 hour. Designed to be taken concurrently with BCS 240 (Basic Neurobiology). Five laboratory sessions reinforce concepts introduced in BCS 240. Each session lasts approximately two hours. BCS 240L is a prerequisite for the upper-level neurobiology laboratory course (BCS 203). (Fall)

242. Neuropsychology. Examines clinical neuropsychology, which bridges neurology, neuroscience, and clinical psychology. Covers history of clinical neuropsychology, principles of neuropsychological assessment, and the interpretation of cognition and behavior as they relate to brain dysfunction. Considers specific neurological syndromes including neurodegenerative, cerebrovascular, toxic, and memory disorders; epilepsy; head trauma; toxic disorders; infectious processes; pediatric neuropsychology; psychiatric syndromes; and forensic neuropsychology. Patient presentations (videotape and in-person interviews) supplement lectures. Prerequisite: BCS 110 or equivalent background. Same as NSC 242. (Spring)

243. Neurochemical Foundations of Behavior. Introduces the field of neurochemistry with an emphasis on cellular and molecular neurochemistry. Topics range from study of neurochemical mechanisms that underlie normal neural function to discussion of behavioral disturbances that result from neurochemical abnormalities. Considers neurochemical mechanisms of adaptive behavior, learning and memory, behavioral disorders, gender differences, and drug seeking behavior. Prerequisite: BCS 240 (NSC 201); an introductory knowledge of biochemistry recommended. Same as NSC 243. (Fall)

244. Neuroethology. Explores the neural basis of naturally occurring animal behaviors. Emphasizes how information is integrated from interactions between molecules, cells, and groups of cells, all of which are necessary to produce behavior. Considers how hormones, neural development, anatomy, physiology, and evolution lead to behaviors such as orientation, communication, feeding, and reproduction. Prerequisite: BCS 110 or 240 (NSC 201). Same as NSC 244. (Spring)

245. Sensory and Motor Neuroscience. Provides an overview of the neural basis of perception and action, covering vision, audition, somatosensation, chemical senses, eye movements, and reaching. Topics include a review of sensory transduction, how the brain extracts information from sensory signals, how muscles convert nerve impulses into mechanical forces, how different movements are encoded in the brain, and how an animal's internal state (e.g., memory or attention) influences the course of action. Prerequisite: BCS 240 (NSC 201) or equivalent background with instructor's permission. Same as NSC 245. (Spring)

246. Biology of Mental Disorders. Examines the neurobiology of anxiety/phobic conditions, mood disorders, and chronic psychotic states, particularly schizophrenia. Considers definitions of psychiatric syndromes, the problems of diagnosis, brain organization, and neurotransmitter systems involved in "state" functions. Introduces research approaches including epidemiologic, phenomenologic, family/adoption, longitudinal descriptive, psychophysiologic, neuropharmacologic, genetic linkage, and postmortem studies; emphasizes recent in vivo brain imaging and neuroreceptor studies. Prerequisite: BCS 110 or equivalent background. Same as NSC 246. (Fall)

248. Neurobiology of Learning and Memory. Provides a basic overview of the neural basis of learning and memory formation, with a focus on the acquisition of simple associations and complex memories and skills. Considers how neurons and neuronal ensembles encode, consolidate, store, and retrieve specific memories. Although emphasis is on the anatomical, molecular, and cellular levels, findings obtained from the perspective of systems and cognitive neuroscience are also considered. Prerequisite: NSC 201 or equivalent background. Same as NSC 248. (Fall)

249. Developmental Neurobiology. Advanced treatment of the development of the nervous system, including the nature/nurture issue and factors that influence the development of neural organization and function. Topics include the production, migration, differentiation and survival of neurons; functional specialization of neural regions; axonal navigation; target mapping. Compares and contrasts developmental plasticity with forms of neural plasticity exhibited in adults. Prerequisite: BCS 240 (NSC 201), or equivalent background. Same as NSC 249. (Spring)

259. Language Development. Introduces children's language development, including the acquisition of phonology, syntax, and semantics. Focuses on the acquisition of a first language by young children, comparing the acquisition of a variety of spoken and signed languages to find possible universal principles of language learning. Prerequisites: One of the following: BCS 110, 111, 112, 172, LIN 110, PSY 101, or equivalent background. (Spring)

260. Music and the Mind. Introduction to the discipline of music cognition. Topics include empirical methods, psychoacoustic principles, influence of Gestalt psychology, music and language, metric and tonal hierarchies, music and the brain, aspects of musical development, and research on musical memory, expectation, and emotion. Prerequisite: One semester of collegiate music theory, or permission of instructor. (Spring)

261. Language Use and Understanding. Explores the cognitive mechanisms used to speak and understand language, with a special focus on contextually situated language use. Studies the moment-by-moment processes underlying language production and

comprehension, including how speakers choose words and phrases and how listeners understand them. Prerequisite: BCS 152. (Spring, odd-numbered years)

264. Signed Language Structure. Examines signed languages and the cognitive constraints that shape them, through a detailed consideration of the structure of American Sign Language and other natural signed languages of the world. Includes training in sign language notation and analysis. Knowledge of sign language is not required. Prerequisites: ASL 105; LIN 210, 220, or 226; or permission of instructor. (Spring)

265. Language and the Brain. Examines how the comprehension and production of language is implemented in the human brain. Uses evidence from neuropsychological and brain imaging studies to consider the following questions: What is the network of brain areas that subserves language processing? What are the specific functions of these areas? What happens when these brain areas are damaged? What is the timing of brain activity in these areas during language processing? Finally, how do the brain areas involved in language processing overlap with those involved in other complex cognitive processes? Prerequisites: BCS 152 and 110. (Spring)

310. Senior Seminar. Credit—2 hours. Required of all senior BCS majors who do not enter the honors program. Emphasizes reading, evaluating, and discussing primary research papers. Each student chooses a topic, becomes familiar with it, selects a classic paper, leads a class discussion, and writes an evaluation of the paper as though providing peer review for a journal. Prerequisite: Senior concentrators. (Fall and Spring)

311. Senior Seminar (Honors). Credit—2 hours. Required of seniors in the BCS honors program. Students choose a classic paper for the class to read, lead a discussion of it, and give a formal oral and written presentation of their honors theses. To be taken in the semester the honors thesis is completed. Prerequisites: Senior concentrators and permission of department. (Spring)

389. Vision Science Research and Colloquium. Intended for students who are engaged in research in the Center for Visual Science and who may be considering a career in research. Provides exposure to the research environment of the Center through the regular research meetings and colloquia attended by CVS graduate students, postdocs, and faculty. Students also complete a paper on a vision-related topic. No prerequisites. Same as CVS 389. (Fall and Spring)

390. Teaching Tutorial. By individual arrangement with faculty, undergraduates serve as teaching assistants in a BCS or neuroscience core course that they have previously completed. Students attend all classes and hold regular office hours. Responsibilities may also include holding regular recitation sections, study groups, demonstrations, and aiding in preparation of quizzes and exams. (Fall and Spring)

391. Independent Study. A special program of reading in advanced aspects of neural and/or cognitive sciences. Designed by individual arrangement with a faculty member in the Department of Brain and Cognitive Sciences. (Fall and Spring)

392. Practicum. A research course that involves the supervised practical application of concepts related to understanding the brain and behavior. Designed by individual arrangement with a faculty member in the Department of Brain and Cognitive Sciences. (Fall and Spring)

395. Independent Research. A research course designed by individual arrangement with a faculty member. Complete descriptions of Faculty Research Programs can be found on the Web (www.bcs.rochester.edu) or obtained from the department's Undergraduate Programs Office (102 Meliora). (Fall and Spring)

396. Honors Research. An independent research course designed by individual arrangement with a faculty member and required of students enrolled in the Honors Research Program. Prerequisites: Completion of at least one semester of Independent Research (BCS 395) and submission of a thesis proposal. Department approval required.

BUSINESS

The William E. Simon Graduate School of Business Administration offers a minor in business for undergraduate students in the College. The minor is administered through the College Center for Academic Support and supervised by a faculty committee. Students who wish to enroll in the program should pick up an Approval Form for Majors and Minors in 312 Lattimore and see the authorized advisor there. Students need to have been formally accepted into a major before they may declare a minor.

COMMITTEE FOR THE MINOR IN BUSINESS

Mark Bils, Ph.D. (M.I.T.) *Professor of Economics*

Rajiv M. Dewan, Ph.D. (Rochester) *Associate Professor of Electronic Commerce and Computers and Information Systems, William E. Simon Graduate School of Business Administration*

Ronald Hansen, Ph.D. (Chicago) *Senior Associate Dean, William E. Simon Graduate School of Business Administration and Chair of the Committee*
Michael Wolkoff, Ph.D. (Michigan) *Senior Lecturer in Economics*

REQUIREMENTS FOR THE MINOR IN BUSINESS
This minor is aimed at building core business skills. It contains five courses consisting of three core courses and two electives.

Prerequisites
In order to be accepted into the minor in business, students must first satisfactorily complete:
a. One statistics course from the following:
• STT 211. Applied Statistics for the Social Sciences I
• STT 212. Applied Statistics for the Biological and Physical Sciences I
• STT 213. Elements of Probability and Statistics
• STT 216. Applied Statistics II
• ECO 230. Economic Statistics
• MTH/STT 203. Introduction to Mathematical Statistics
• PSY/CSP 211. Introduction to Statistical Methods in Psychology
• PSC 200. Applied Data Analysis
• PSC 201. Political Inquiry
b. ECO 108, Principles of Economics. (ECO 207, Intermediate Microeconomics, can substitute for ECO 108.)

Core Courses
Three required courses:
• ACC 201. Principles of Accounting
• MKT 203. Marketing (prerequisites: ACC 201, ECO 207 or equivalent)
• FIN 205. Financial Management—for students with ECO 207 and the first semester of calculus (prerequisites: ACC 201, ECO 207 or equivalent **OR** FIN 204)

Electives
Two required courses from the following:
• LAW 205. Business Law
• OMG 231. Operations and Information Systems Management
• ACC 221. Cost Accounting (prerequisite: ACC 201)
• FIN 206. Investments (prerequisites: FIN 205, MTH 210)
• MKT 213. Marketing Projects and Cases (prerequisite: MKT 203)
• ECO 211. Money Credit & Banking (prerequisite: ECO 207)
• ECO 217. Economics of Contracts Organizations and Markets (prerequisites: ECO 207)
• Internship (Independent Studies, either Simon or ECO 394)
• PHL 118. Business Ethics
• CSP/PSY 264. Industrial and Organizational Psychology
• MTH 208. Operations Research (prerequisite: MTH 165)
• EAS/CAS 201K. Entrepreneurship and New Product Development

Students must meet prerequisites and/or
co-requisites for individual courses. College rules on overlap apply. (No more than two courses may overlap among the five required courses comprising this minor and a major, or between the five required courses comprising this minor and a separate minor.)

Students using the business minor to fulfill the social science distribution area requirement must complete, in addition to ECO 108 or ECO 207, a minimum of two additional ECO or CSP courses from the list of electives.

CHEMISTRY

Robert K. Boeckman, Ph.D. (Brandeis) *Marshall D. Gates, Jr., Professor of Chemistry; Chair of the Department*

Kara L. Bren, Ph.D. (California Institute of Technology) *Professor of Chemistry*
Esther Conwell, Ph.D. (Chicago) *Professor (Research) of Chemistry and of Physics*
Joseph P. Dinnocenzo, Ph.D. (Cornell) *Professor of Chemistry*
Richard S. Eisenberg, Ph.D. (Columbia)
Tracy H. Harris Professor of Chemistry
Samir Farid, Ph.D. (Göttingen) *Professor (Research) of Chemistry*
James M. Farrar, Ph.D. (Chicago) *Professor of Chemistry*
Joshua L. Goodman, Ph.D. (Yale) *Professor of Chemistry*
William D. Jones II, Ph.D. (California Institute of Technology) *Charles Frederick Houghton Professor of Chemistry*
Thomas R. Krugh, Ph.D. (Pennsylvania State) *Professor of Chemistry*
Lewis Rothberg, Ph.D. (Harvard) *Professor of Chemistry, of Chemical Engineering, and of Physics*
Wolf-Udo Schröder, Ph.D. (Darmstadt)
Professor of Chemistry and of Physics
Ching W. Tang, Ph.D. (Cornell) *Doris Johns Cherry Professor, Professor of Chemical Engineering, of Chemistry, and of Physics*
Douglas H. Turner, Ph.D. (Columbia) *Professor of Chemistry and of Pediatrics, and in the Center for Pediatric Biomedical Research*
Alison J. Frontier, Ph.D. (Columbia) *Associate Professor of Chemistry*
Patrick L. Holland, Ph.D. (California, Berkeley) *Associate Professor of Chemistry*
Todd D. Krauss, Ph.D. (Cornell) *Associate Professor of Chemistry and of Optics*
Rudi Fasan, Ph.D. (Zurich) *Assistant*
Professor of Chemistry
David W. McCamant, Ph.D. (California, Berkeley) *Assistant Professor of Chemistry*
Bradley L. Nilsson, Ph.D. (Wisconsin)
Assistant Professor of Chemistry
Misha Ovchinnikov, Ph.D. (Utah) *Assistant Professor of Chemistry*
Harry A. Stern, Ph.D. (Columbia) *Assistant Professor of Chemistry*
Daniel Weix, Ph.D. (California, Berkeley) *Assistant Professor of Chemistry*
Frank P. Buff, Ph.D. (California Institute of Technology) *Professor Emeritus of -Chemistry*
John R. Huizenga, Ph.D. (Illinois) *Tracy H. Harris Professor Emeritus of Chemistry and Professor Emeritus of Physics*
Jack A. Kampmeier, Ph.D. (Illinois) *Professor Emeritus of Chemistry*
Andrew S. Kende, Ph.D. (Harvard) *Charles Frederick Houghton Professor Emeritus of Chemistry*
Robert W. Kreilick, Ph.D. (Washington University) *Professor Emeritus of Chemistry*
John S. Muenter, Ph.D. (Stanford) *Professor Emeritus of Chemistry*
William H. Saunders, Jr., Ph.D. (Northwestern) *Professor Emeritus of Chemistry*

Approximately 100 graduate teaching fellows and specially chosen undergraduates assist the faculty in the presentation of the teaching program. The majority of the teaching assistants are used in the lower-level, high-enrollment courses to help the students with questions and problem solving that arise out of the lectures and/or homework assignments.

The Department of Chemistry is committed to the search for new insights into problems in chemistry and to the presentation of our understanding of chemistry to students at all stages of the educational spectrum, from the beginner to the accomplished scholar. Thus, the department presents programs of teaching and research for undergraduate, graduate, and postdoctoral students. The size and attitudes of our department create a rich interplay among these programs. Our research and teaching goals are complementary. We want students to catch both our ideas and our enthusiasm. All faculty teach undergraduate students; all faculty are actively involved in chemical research. An undergraduate student gets the benefits of facilities and a community of faculty and students dedicated to the contemporary ideas and problems in chemistry; the faculty value the challenges and the stimulation of presenting their ideas to others and the collaboration with students that leads to new understanding. Students move easily through the spectrum of departmental activities. Undergraduates are an integral part of the research programs of the department; it is common to find a laboratory with an undergraduate, a graduate student, a postdoctoral student, and a faculty member working side by side. In a similar fashion, some of the teaching programs in the department involve faculty, postdoctoral students, graduate students, and advanced undergraduates working as a team to present ideas and techniques to beginning students.

Chemistry is a rich and fascinating subject that ranges in concern from macromolecular bio-polymers to problems in subatomic structure and in time scales from eons to picoseconds. The skills of chemists range from sophisticated levels of mathematical abstraction to the ele-gant conception and execution involved in the synthesis of complex, naturally occurring molecules. The chemist's view of the atomic and molecular structure of the world is one of the major intellectual forces that shape modern thought. The chemist's skill and understanding have revolutionized many areas of modern society, such as agriculture, clothing and shelter, health care, and energy resources. The department hopes, of course, to prepare and stimulate students to professional achievement and accomplishment in

chemistry. At the same time, we recognize the fundamental nature of our discipline and its proper role as the basis and com-plement to study and accomplishment in a host of other areas. A number of our students will find their fascination and aspirations in related or interdisciplinary fields. We aim to give them the insights and the skills in chemistry that will support their work in these areas.

GENERAL COURSE INFORMATION

The first-year chemistry offerings consist of CHM 131 and CHM 171Q in the fall semester and CHM 132 and CHM 172Q in the spring. These courses are intended for all students following programs requiring two or more years of chemistry, including those seeking careers in health professions. The CHM 131/132 sequence is intended for most regular students needing general chemistry. The quest sequence 171Q/172Q is intended for students who have an AP score of 4 or 5 in chemistry and who are prepared to begin *organic chemistry* as a freshman. The two sections of CHM 131/132 courses in each semester follow the same basic curriculum. The two CHM 131 sections have identical laboratory experiments, as do the two sections in CHM 132.

Organic chemistry is offered with a lecture and a laboratory course each semester. The organic chemistry lectures are CHM 203 in the fall, and CHM 204 in the spring. The organic chemistry laboratories are CHM 207 in the fall, and CHM 208 or 210 (recommended for majors) in the spring.

The department offers undergraduate programs leading to both B.A. and B.S. degrees. In general, the programs differ in the choice and timing of courses in the junior and senior years; an early choice between programs is not required. Between the two programs, the students can arrange a chemistry major that covers the fundamentals as essential background for a specific career in some other area or that provides rigorous and thorough preparation for professional work in chemistry. A minor in chemistry is also available. Specific programs are described below.

B.A. PROGRAM IN CHEMISTRY

The B.A. program makes fewer specifications at the advanced level than the B.S. degree and encourages a wide range of elective courses. It is particularly suitable for students with interdisci-plinary scientific interests in the health professions, biology, physics, geological sciences, engineering, or education. B.A. students may elect advanced courses in chemistry, including independent research, and can, thereby, create a curriculum best suited to their individual interests.

REQUIREMENTS FOR THE B.A. IN CHEMISTRY

- CHM 131 (General Chemistry) (or equivalent AP credit)
- CHM 171Q/203, 172Q/204, 173Q/207 (Organic Chemistry)
- Three of the following: CHM 132, 211, 251, 252
- Two of the following: CHM 210, 231, 232, 234
- Two additional 200-level or higher chemistry courses or other science courses approved by the Undergraduate Advising Committee (8 credits). No more than 4 credits may be from laboratory courses, and no credits can be from independent research. Examples of courses that may be used are available from the Chemistry Undergraduate Advising Committee or at www.chem.rochester.edu/undergrad.
- MTH 161 and 162
- MTH 163/165 or a course in computer science (CSC 170, 171) or statistics (STT 201, 211, 212)
- PHY 113–114. Students wishing a more rigorous background in physics are advised to take PHY 121–123, or 121 and 142–143, instead of 113–114.
- Additional courses in physics, mathematics, and other sciences such as biology, geology, etc., may be taken as part of the concentration.
- Satisfaction of the Upper-Level Writing Requirement.

B.A. candidates considering employment in the chemical profession or graduate work in chemistry should include CHM 210, 211, 231, 232, 251, and 252 in their curriculum.

B.S. PROGRAM IN CHEMISTRY

The B.S. program is designed primarily for students who anticipate professional careers in chemistry and related science. The program provides the range of knowledge, skills, and experience required for work as a professional chemist or for entry into graduate studies in chemistry. The fundamental work is completed by the end of the third year, leaving the senior year free for graduate-level coursework and a full year of independent research with one of the department faculty. A B.S. program that includes a biochemistry course meets all of the requirements for an American Chemical Society approved degree.

REQUIREMENTS FOR THE B.S. IN CHEMISTRY

- Either the series CHM 131, 132, 203, 204, 207, and 210 or the series CHM 131 (or equivalent AP credit), 171Q, 172Q, 173Q, 210, and CHM 262 or BIO 250 (Biochemistry), CHM 132, or an approved 200/400-level science course
- CHM 211, 251, and 252
- CHM 231, 232, and 234[1]
- CHM 393 (senior research, 8 credits total)[2]
- 400-level chemistry course[3]
- MTH 161, 162, 163/165 plus one additional course in mathematics (MTH 164 or a 200-level mathematics course), computer science (CSC 170, 171) , or statistics (STT 201, 211, 212)
- PHY 121–123, or 121 and 142–143
- Satisfaction of the Upper-Level Writing Requirement.

While the required courses leading to a B.S. in chemistry may be scheduled with some flexibility (e.g., the mathematics and physics courses), the following program is suggested:

REGULAR SEQUENCE

First Year

CHM 131	CHM 132
MTH 161	MTH 162
Elective	PHY 121
Elective	Elective

Second Year

CHM 203	CHM 204
CHM 207	CHM 210
MTH 163/165	PHY 123
PHY 122	Elective[4]
Elective	Elective

Third Year

CHM 211	CHM 232
CHM 231	CHM 234[1]
CHM 251	CHM 252
Elective[4, 5]	Elective[4, 5]

Fourth Year

CHM 393[2]	CHM 393[2]
400-level CHM[3]	Elective[4, 5]
Elective	Elective[6]
Elective	Elective

QUEST SEQUENCE

First Year

CHM 171Q	CHM 172Q
CHM 173Q	CHM 210
MTH 161	MTH 162
Elective	PHY121
Elective	Elective

Second Year

CHM 211	CHM 234[1]
MTH 163/165	PHY 123
PHY 122	Elective
Elective	Elective

Third Year

CHM 231	CHM 232
CHM 251	CHM 252

Elective	Elective[6]
Elective	Elective

Fourth Year

CHM 393[2]	CHM 393[2]
400-level CHM[3]	Elective[4, 5]
Elective	Elective[6]
Elective	Elective

Students who complete CHM 171Q/172Q courses during their first year should consult with a chemistry advisor to plan the remainder of their program.

REQUIREMENTS FOR A MINOR IN CHEMISTRY

- Any six courses (4 credits or greater) in chemistry.

Courses at the 400-level may be included with the permission of the instructor. Prerequisites for advanced courses, such as prior chemistry courses or the mathematics and physics prerequisites for courses in physical chemistry, must be taken in addition to the six required chemistry courses.

Each minor will be assigned a faculty advisor who must approve the student's proposed program, normally at the end of the sophomore year. Particular attention should be given to the intellectual coherence of the program in terms of the student's goals. Two courses with substantial overlap of content should not be included in a program.

REQUIREMENTS FOR A DOUBLE DEGREE

Students who wish to receive a B.A. in chemistry and a B.S. in another discipline must satisfy the following additional requirements:

- CHM 211, 251, and 252
- Completion of at least two of the following: CHM 231, 232, 234.

UPPER-LEVEL WRITING REQUIREMENT

All chemistry majors are required to complete two upper-level writing courses ("W" courses). At least one of these courses must be a chemistry department course selected from the list below. In each chemistry writing course students are required to submit a total of four writing requirement laboratory reports. Two types of reports are required in each course: one report is written so that a well-educated non-scientist is able to understand the content; the second report is written as a formal scientific presentation with appropriate literature references. The writing requirement may be satisfied in the following courses: CHM 210W, 231W, 232W, 234W, 393W. Students may use one writing course from another department for one of the two required writing courses.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

131. Chemical Concepts, Systems, and Practices I. Credit—5 hours. This course is an introduction to the concepts of chemistry for science and engineering students, health professions students, and as a science course for students of the humanities and social sciences. Properties of chemical systems are discussed from a macroscopic and molecular perspective with examples developed from a wide range of disciplines. The topics covered include stiochiometry, atoms and molecules, properties of gases, thermochemistry, chemical equilibrium, acids and bases, solubility equilibria, and oxidation-reduction reactions. Laboratory is an integral part of the course. Prerequisite: high school chemistry. (Fall)

132. Chemical Concepts, Systems, and Practices II. Credit—5 hours. A continuation of Chemical Concepts, Systems, and Practices I, emphasizing molecular and macroscopic approaches to chemical systems with examples concerned with life sciences or energy and the environment. Topics covered include chemical kinetics, electrochemistry, thermodynamics, properties of atoms, atomic structure, and chemical bonding. Laboratory is an integral part of the course. Prerequisite: CHM 131. (Spring)

171Q/173Q and 172Q/210. Quest Organic Chemistry. A one-year exploration of the basic observations, concepts, and practice of organic chemistry, with a focus on the fundamental relationships among molecular structure and chemical reactivity. The exploration requires that students grapple with Quest issues: defining questions, evaluating evidence, weighing arguments, reflecting on epistemological issues, constructing new experiments, etc. The study of organic chemistry is carefully integrated with a review of

the key concepts from general chemistry. Quest Organic is designed for first-year students with good preparation in chemistry (e.g., two years of general chemistry and Advanced Placement score 4 or 5, or equivalent preparation). CHM 171Q (Fall) and 172Q (Spring) are 4-credit courses that meet for three lectures and one two-hour workshop each week. CHM 173Q (Fall) meets for one lab afternoon per week (1 credit). CHM 172Q has a required companion lab, CHM 210 (2 credits). (Spring)

203. Organic Chemistry I. An introduction to organic chemistry that focuses on chemical bonding, structure and stereochemistry, reactions and reaction mechanisms of organic compounds. Prerequisites: CHM 131 and 132 or the equivalent; co-registration in CHM 207. (Fall)

204. Organic Chemistry II. A continuation of a two-semester sequence in the study of organic chemistry. Topics covered include the reactivity of various functional groups, approaches to organic synthesis, reactivity of conjugated systems, polymers and molecules of biological significance. Prerequisites: CHM 203 or the equivalent plus one semester of organic laboratory (CHM 207 or the equivalent); co-registration in CHM 208 or 210. (Spring)

207. Organic Chemistry I Laboratory. Credit—1 hour. One lab lecture and lab session per week provide an introduction to the characterization and reactivity of organic molecules. The course provides an introduction to modern laboratory techniques used in organic chemistry. Prerequisite: co-registration in CHM 203. (Fall)

208. Organic Chemistry II Laboratory. Credit—1 hour. A continuation of the laboratory sequence begun in CHM 207. One laboratory lecture and lab session per week. Prerequisites: CHM 207; co-registration in CHM 204. (Spring)

210/210W. Organic Chemistry IIH
Laboratory. Credit—2 hours. A laboratory using advanced, modern experimental techniques. One lab lecture and two laboratory sessions per week. This laboratory is required for chemistry majors. Prerequisites: CHM 207 or 173Q; co-registration in CHM 204 or 172Q. (Spring)

211/411. Inorganic Chemistry. This course covers descriptive chemistry of main group elements, bonding in inorganic systems, coordination chemistry, and the properties and reactions of transition metal complexes. Graduate students (411) will have an additional assignment. (Fall)

231/231W. Chemical Instrumentation. This course provides an understanding of both the method and the application of modern chemical instrumentation to chemical problems and systems. The problems are deliberately chosen to cover a range of different chemical systems. One lecture, two labs per week. Prerequisite: one year each of General and Organic Chemistry; one year each of college physics and mathematics. (Fall)

232/232W. Experimental Molecular Spectroscopy. A thorough study of the principles and practice of spectroscopic methods of modern physical chemistry. Three lectures, one lab per week. Prerequisite:
CHM 251. (Spring)

234/234W. Advanced Laboratory Techniques. Advanced laboratory techniques of synthesis, characterization, and analysis applied to problems in inorganic and organic chemistry. One lecture, two labs per week. Prerequisite: CHM 211 recommended. (Spring)

251/441. Physical Chemistry I. Introduction to quantum mechanics with applications to spectroscopy and to atomic and molecular structure. Problem oriented. Graduate students (441) have additional requirements. Prerequisites: PHY 121–123 or 113–114, MTH 163 or MTH 165. (Fall)

252. Physical Chemistry II. Thermodynamics, statistical mechanics, solutions, and chemical kinetics. Prerequisites: PHY 121–122 or 113–114. (Spring)

262/462. Biological Chemistry. An introduction to biochemistry—the chemical processes of life. Topics covered include proteins and nucleic acids, recombinant DNA technology, biological catalysis, and energy transduction. Structure and function of biological macromolecules are emphasized. Graduate students (462) will have additional requirements. Students will not receive credit for BIO 250 and CHM 262/462. Prerequisites: at least one semester of organic chemistry. (Spring)

352. Issues in Workshop Leadership. Credit—2 hours (Fall), 1 hour (Spring). This course prepares students to be effective workshop leaders in chemistry courses. Topics include group dynamics, diversity, student development, learning theory, cognitive apprenticeship, metacognition, and constructivism. These ideas are developed and applied in the context of workshop practice. (Fall and Spring)

***391. Independent Study.** Credit—2 to 4 hours. Individual study of advanced topics arranged by students. Prerequisite: registration in or credit for CHM 211. (Fall and Spring)

***393. Senior Thesis Research.** Independent research directed by faculty member. To be arranged during semester preceding registration. Written report and participation in a department poster session required. (Fall and Spring)

***395. Independent Research.** A research course designed by individual arrangement with a faculty member. Plan on spending at least the equivalent of two afternoons (eight hours) a week in the lab. (Fall and Spring)

The following graduate courses are open to advanced undergraduates with permission of the instructor.

†402. Biophysical Chemistry I. Introduction to the theory and practical application of several major techniques used in the structural characterization of biological macromolecules. These methods include NMR and comparative modeling, small angle X-ray scattering, spectroscopic and calorimetric techniques, and X-ray crystallography. Prerequisite: CHM 252 or its equivalent. (Spring,

even years)

†**404. Biophysical Chemistry II.** Explores how fundamental interactions determine the structure, dynamics, and reactivity of proteins and nucleic acids. Examples are taken from the current literature with emphasis on thermodynamic, kinetic, theoretical, and site-directed mutagenesis studies. Prerequisite: CHM 252 or its equivalent. (Spring, odd years)

***411/211. Inorganic Chemistry.** Descriptive chemistry of main group elements, bonding in inorganic systems, coordination chemistry, and the properties and reactions of transition metal complexes. Graduate students enroll in 411, and will have an additional assignment. (Fall)

***414. Bioinorganic Chemistry.** Discussion of the role of metal ions in biological systems, especially enzymes. Uptake and regulation of metals, common spectroscopic techniques used for studying metals, and mechanisms through which they react. Other topics include metal ion toxicity, metal-based drugs, and interaction of metals with nucleic acids. Prerequisite: CHM 211 equivalent background. (Fall)

***415. Group Theory.** Credit—2 hours. Development of symmetry and group theory concepts and scope of applications to chemical problems. (Fall, first half semester)

***417. X-Ray Crystallography.** Credit—2 hours. Basic principles of X-ray diffraction, symmetry, and space groups. Students also experience the single crystal diffraction experiment, which includes crystal mounting, data collection, structure solution and refinement, and the reporting of crystallographic data. (Fall, second half semester)

***421. Basic Organometallic Chemistry.** Credit—2 hours. Examination of the concepts, systems, reactions, and applications of organometallic chemistry. Structure and bonding of complexes having carbonyl, alkyl, carbene, olefin, CnHn, and related pi ligands. Oxidative addition, insertion, elimination reactions, and other fundamental reactions of organometallic compounds. (Fall, second half semester)

***422. Nuclear Magnetic Resonance Spectroscopy.** Credit—2 hours. An introduction to NMR spectroscopy. Collection, processing, and interpretation of homonuclear and heteronuclear 1D and multidimensional spectra are covered. Topics discussed include chemical shifts, relaxation, and exchange phenomena. Examples from organic, inorganic, and biological chemistry are used. Prerequisite: one year of organic chemistry and one semester of physical chemistry (CHM 251). (Fall, second half semester)

***423. Organometallic Chemistry, Survey.** Credit—2 hours. Mechanisms in organometallic reactions. Applications of organometallic compounds in homogeneous catalysis, polymerization, metathesis. Prerequisite: CHM 421. (Spring, first half semester)

***424. Physical Methods in Inorganic.** Chemistry. Credit—2 hours. Molecular and electronic structure determination of inorganic compounds and metal complexes; spectroscopic and physical methods. Prerequisite: CHM 211/411 or a course in inorganic chemistry. CHM 422 is strongly recommended. (Spring, second half semester)

***426. Organic Structure Determination Techniques.** Credit—2 hours. The modern methods and tools employed for the determination of the structure of complex organic molecules are discussed. Among the areas discussed are basic NMR (1D and 2D), IR, UV, and mass spectroscopy. Problem-solving techniques are illustrated and problem-solving skills developed by means of problem sets and class examples. Prerequisite: CHM 422. (Spring, second half semester)

***433. Advanced Physical Organic**

Chemistry I. An understanding of the structure and reactivity of organic compounds by using molecular orbital theory is provided. Some perspectives on the relationships among structure, mechanism, and reactivity are discussed in the context of a number of fundamental concepts and principles, such as molecular orbital theory, frontier molecular orbital theory, stereochemistry, conformational analysis, stereoelectronic effects, thermodynamics and equilibria, kinetics, linear free-energy relationships, acids and bases catalysis, nonclassical ions, and concerted pericyclic reactions. Prerequisite: one year of organic chemistry or equivalent. (Fall)

***434. Advanced Physical Organic Chemistry II.** Structure and reactivity; kinetics, catalysis, medium effects, transition state theory, kinetic isotope effects, photochemistry, reactive intermediates, and mechanisms. Prerequisite: one year of organic chemistry or equivalent. (Spring)

***435. Organic Reactions.** A survey of reactions of organic substances with emphasis on those with practical synthetic utility including discussion of mechanism, scope and limitations, and stereochemical issues. Prerequisite: one year of organic chemistry or equivalent.(Fall)

***436. Organometallic Chemistry for Organic Synthesis.** Credit—2 hours. The transition metal mediated organometallic reactions most commonly employed in organic synthesis are discussed including their substrate scope, mechanism, and stereo- and/or regiochemical course. Emphasis is placed on the practical aspects such as catalyst and reaction condition selection, and protocols for trouble shooting catalytic cycles. Prerequisite: CHM 421. (Spring, first half semester)

***437. Bioorganic Chemistry and Chemical Biology.** An introduction to bioorganic chemistry and chemical biology. The course draws heavily from the primary literature to present a survey of how the principles of organic chemistry have been used to explain and exploit biological phenomena. Course topics include the use of organic chemistry to understand oligonucleotides, proteins, and oligosaccharides; design of organic molecules for recognition and catalysis in biological systems; chemical genetics; introduction to principles of drug design. Prerequisite: one year of organic chemistry or equivalent, one semester of biology recommended. (Fall)

***438. Advanced Synthetic Strategy.** Credit—2 hours. A formalism describing commonly employed strategies and tactics for the

analysis of complex problems in organic synthesis is presented. Examples of such strategies are compared and contrasted during discussion of published complex molecule syntheses. Prerequisite: CHM 435. (Spring, second half semester)

441/251. Physical Chemistry I. Introduction to quantum mechanics with applications to spectroscopy and to atomic and molecular structure. Problem oriented. Graduate students have additional requirements. Prerequisites: PHY 121–123 or 113–114, MTH 163 or MTH 165. (Fall)

***451. Quantum Chemistry I.** Basic quantum chemistry, Schrödinger equation, basic postulates of quantum mechanics, angular momentum, perturbation theory, and molecular structure. Prerequisite: one year of physical chemistry or equivalent. (Fall)

***452. Quantum Chemistry II.** Continuation of CHM 451. Matrix formulation of quantum mechanics, time evolution of quantum mechanical systems, density matrices, theories of molecular electronic structure, time-dependent problem, and interaction of radiation with matter, including absorption, emission, and multiphoton process. Prerequisite: CHM 451. (Spring)

***455. Thermodynamics and Statistical Mechanics.** The course draws connections between the orderly and chaotic behavior of simple and complex systems, laying the foundations of statistical equilibrium and equilibrium thermodynamics. The different phases of matter (gases, liquids, solids) assumed by bulk classical interacting particles and their transitions are discussed in this approximation. Properties of noninteracting quantal systems are expressed in terms of partition functions, for gases of simple and complex particles. Nonequilibrium statistical behavior of multiparticle systems leads to diffusion and other transport phenomena. Prerequisite: CHM 251 or equivalent. (Fall)

***456. Chemical Bonds: from Molecules to Materials.** An introduction to the electronic structure of extended materials systems from both a chemical bonding and a condensed matter physics perspective. The course discusses materials of all length scales from individual molecules to macroscopic three-dimensional crystals, but focuses on zero-, one-, and two-dimensional inorganic materials at the nanometer scale. Specific topics include semiconductor nanocrystals, quantum wires, carbon nanotubes, conjugated polymers, and their application to solar energy conversion. Prerequisite: CHM 251 or an equivalent course on introductory quantum mechanics. (Spring)

***458. Molecular Spectroscopy and Structure.** Credit—2 hours. The course covers the basic theory and experimental practice of spectroscopy in molecules and condensed matter. A general review of electromagnetic waves is followed by time-dependent perturbation theory and a density matrix treatment of two-level systems. The basic principles are applied electronic, vibrational, and rotational spectroscopy. The course draws heavily on literature studies that exemplify the material. Prerequisites: CHM 451 or permission of instructor. (Spring, first half semester.)

***460. Chemical Kinetics.** Credit—2 hours. Within the broad area of chemical kinetics, this course focuses on basic concepts of kinetics, photochemistry, and electron-transfer (eT). In addition to studying bulk reaction rates, we discuss Marcus's theory of eT, intramolecular vibrational energy redistribution (IVR) and vibrational cooling, and the fates of photoexcited species (radiative and nonradiative decay channels). We address the experimental quantification of these kinetics using time-resolved spectroscopy and analysis of kinetic data. The course material is somewhat continuous with that of CHM 458. Prerequisite: CHM 451 or permission of instructor. (Spring, second half semester)

***462/262. Biological Chemistry.** An introduction to biochemistry—the chemical processes of life. Topics covered include proteins and nucleic acids, recombinant DNA technology, biological catalysis, and energy transduction. Structure and function of biological macromolecules are emphasized. Graduate students have additional requirements. Students do not receive credit for CHM 462/262 and BIO 250. Prerequisites: at least one semester of organic chemistry. (Spring)

***466. Nuclear Science and Technology I.** Nuclear technologies of measurement, accelerators and radiation detection, effects and applications of radiation. Fundamental particles interactions, quark model. Nuclear masses, sizes, and shapes. Overview of microscopic and macroscopic models of the nucleus. Nuclear radioactivity and decay modes. Introduction to nuclear reaction theory, classical potential scattering, semiclassical and quantal models of scattering, nuclear excitation, and mass transfer. Mathcad computer projects. Prerequisite: familiarity with calculus, principles of mechanics, electrodynamics, thermodynamics, and quantum mechanics.
(Spring)

***470. Computational Chemistry.** In this course students learn about a range of computational methods used to attack research problems in chemistry. Emphasis is placed both on the theory underlying computational techniques and on their practical application. Topics include molecular mechanics, ab initio electronic structure theory, density functional theory, molecular dynamics and Monte Carlo simulations, methods for free-energy calculations, path-integral techniques, and methods for protein structure prediction. Prerequisite: Quantum and statistical mechanics at the level of advanced undergraduate physical chemistry. (Fall)

CLINICAL AND SOCIAL SCIENCES

IN PSYCHOLOGY

Patrick Davies, Ph.D. (West Virginia)
Professor of Psychology
Edward L. Deci, Ph.D. (Carnegie Mellon) *Helen F. and Fred H. Gowen Professor in the Social Sciences and Professor of Psychology*
Andrew Elliot, Ph.D. (Wisconsin, Madison) *Professor of Psychology*
Rafael Klorman, Ph.D. (Wisconsin, Madison)
Professor of Psychology and of Brain and Cognitive Sciences
Dale W. McAdam, Ph.D. (Iowa) *Professor of Psychology*
Harry Reis, Ph.D. (New York) *Professor of Psychology and of Psychiatry*
Richard Ryan, Ph.D. (Rochester) *Professor of Psychology, of Psychiatry and of Education*
Judith Smetana, Ph.D. (California, Santa Cruz) *Professor of Psychology*
Miron Zuckerman, Ph.D. (Harvard) *Profes-sor of Psychology; Chair of the Department*
Loisa Bennetto, Ph.D. (Denver) *Associate Professor of Psychology and of Brain and Cognitive Sciences*
Sheree Toth, Ph.D. (Case Western Reserve)
Associate Professor of Psychology
Mandi L. Burnette, Ph.D. (Virginia) *Assistant Professor of Psychology*
Ronald D. Rogge, Ph.D. (California, Los Angeles) *Assistant Professor of Psychology*
Melissa L. Sturge-Apple, Ph.D. (Notre Dame) *Assistant Professor of Psychology*
Barbara Ilardi, Ph.D. (Stanford) *Professor Emeritus of Sociology*
Ladd Wheeler, Ph.D. (Minnesota) *Professor Emeritus of Psychology*
Melvin Zax, Ph.D. (Tennessee) *Professor Emeritus of Psychology*

The department uses teaching assistants in laboratories and as discussion group leaders in large courses.

The Department of Clinical and Social Sciences in Psychology offers programs of study leading to a bachelor's degree in psychology and Ph.D. degrees in clinical psychology, social-personality psychology, and developmental psychology. (See Psychology, page 121, for a description of the psychology major.) The department also offers several clusters in the social sciences.

The department offers instruction in a wide variety of topics, including social psychology, clinical psychology, personality, motivation, and social and emotional development. In all of these areas courses are offered at a broad entry level and also at a more specific advanced level. Parallel to the content-oriented courses, a series of courses on research methodology and statistics is also offered. Here the intent is to introduce the student to the research tools with which psychologists acquire their knowledge because how the research is done can often shed light on what the research has found.

In addition to the standard course offerings, students may pursue their research interests through independent study courses that are offered by individual faculty. These courses offer an opportunity to work closely with a researcher on an ongoing project. For many students, an independent study course is the first step along the path that leads to the honors program. Students can also gain practical experience and earn course credit through various internships. These special offerings are particularly aimed at students intending to pursue graduate degrees in psychology, but other interested students are not excluded. Undergraduates can also register for graduate- level courses with the permission of the advisor and the course instructor.

MAJOR IN PSYCHOLOGY
See Psychology (page 121) for a description of the psychology major.

MINORS IN PSYCHOLOGY
See Psychology (page 121) for a description of the psychology minor.

CLUSTERS IN CLINICAL AND SOCIAL SCIENCES IN PSYCHOLOGY
The following are currently approved or pending social science clusters offered by the department.

Psychology as a Social Science

- PSY 101. Introduction to Psychology
- Two from the following:
  PSY 113. Biopsychology of Social and Clinical Behaviors
  CSP/PSY 161. Social Psychology and Individual Differences
  CSP/PSY 171. Social and Emotional Development
  CSP/PSY 181. Theories of Personality and Psychotherapy
  CSP/PSY 262. Human Motivation and Emotion
  CSP/PSY 263. Relationship Process and Emotions
  CSP/PSY 264. Industrial and Organiza-tional Psychology
  CSP/PSY 267. Psychology of Gender
  CSP/PSY 278. Adolescent Psychology
  CSP/PSY 282. Abnormal Psychology

Psychopathology
- CSP/PSY 282. Abnormal Psychology
- Two from the following:
  CSP/PSY 181. Theories of Personality and Psychotherapy
  CSP/PSY 280. Clinical Psychology
  CSP/PSY 283. Behavioral Medicine
  CSP/PSY 289. Developmental Child Psychopathology
- One of the following may be included
  PSY 242. Neuropsychology
  PSY 246. Biology of Mental Disorders

Psychology of Motivation
- CSP/PSY 262. Human Motivation and Emotion
- One (only) of the following:
  CSP/PSY 161. Social Psychology and Individual Differences
  CSP/PSY 181. Theories of Personality and Psychotherapy
- One of the following:
  CSP/PSY 263. Relationship Process and Emotions
  CSP/PSY 368W. Seminar in Humanistic Psychology
  CSP/PSY 376. Seminar in Self-Determination
  CSP/PSY 398. Research in Motivation

Social Psychology
- CSP/PSY 161. Social Psychology and Individual Differences
- Two from the following:
  CSP/PSY 262. Human Motivation and Emotion
  CSP/PSY 263. Relationship Process and Emotions
  CSP/PSY 267. Psychology of Gender
  CSP 556. Social Psychology of Control

Organizational Psychology
- CSP/PSY 264. Industrial and Organiza-tional Psychology
- Two from the following:
  CSP/PSY 161. Social Psychology and In-divi-dual Differences
  CSP/PSY 181. Theories of Personality and Psychotherapy
  CSP/PSY 262. Human Motivation and Emotion

Personality Psychology

- CSP/PSY 181. Theories of Personality and Psychotherapy
- Two from the following:
  CSP/PSY 161. Social Psychology and Individual Differences
  CSP/PSY 171. Social and Emotional Develo-pment
  CSP/PSY 262. Human Motivation and Emotion
  CSP/PSY 267. Psychology of Gender
  CSP/PSY 364. Achievement Motivation
  CSP/PSY 373. Exploring Research in Social Psychology

Psychology of Developmental Disabilities

- Choose three of the following:
  CSP/PSY 282. Abnormal Psychology
  CSP/PSY 289. Developmental Child Psychopathology
  CSP/PSY 381. Psychology of Developmental Disabilities
  CSP/PSY 384 and/or 385. Practicum in Developmental Disabilities
  CSP/PSY 391. Independent Study Related to Developmental Disabilities
  PM 427. Special Topics in Disabilities

Social and Emotional Development

- CSP/PSY 171. Social and Emotional Development
- Two from the following:
  CSP/PSY 278. Adolescent Development
  CSP/PSY 289. Developmental Child Psychopathology
  CSP/PSY 371. Seminar in Social and Personality Development
  CSP/PSY 377. Research in Family Psychology I
  CSP/PSY 378. Research in Family Psychology II
  CSP/PSY 383. Moral Development

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Course listings can also be found at the department's Web site: www.psych.rochester.edu/csp/. *All courses for undergraduates are cross-listed as CSP and PSY. Following are some of the recent or planned offerings.*

CORE COURSES

113. Biopsychology of Social and Clinical Behaviors. An exploration of biological explanations of topics in social and clinical psychology, e.g., emotions, sexuality, psychopathology, and addiction. (Spring)

161. Social Psychology and Individual Differences. An introduction to the field of social psychology and an overview of research on individual differences in personality. Topics include the self, attitudes, social cognition, emotion, interpersonal attraction, relationships, helping, social influence, group behavior, and dispositional differences among people. Students complete several individual differences measures and receive individualized feedback at the end of the course. Format is lectures augmented with discussions and demonstrations. (Spring)

171. Social and Emotional Development. An examination of the interpersonal, emotional, cognitive, and environmental factors that influence children's social and emotional development from early infancy through late adolescence. (Fall)

181. Theories of Personality and Psychotherapy. A survey of personality, emphasizing modern theoretical approaches, basic methods of investigation, and the relations of these theories to psychotherapy and behavioral change. (Fall)

RESEARCH METHODOLOGY AND LABORATORY OR PRACTICUM COURSES

211. Introduction to Statistical Methods in Psychology. Introduction to the use of statistics in psychological research. Topics include descriptive statistics, correlation and regression, and inferential statistics. Examples are drawn from social and personality psychology. Logic of statistical inference and proper interpretation of research findings are emphasized. (Fall and Spring)

219W. Research Methods in Psychology. An introduction to the basic concepts, logic, and procedures needed to do psychological research. Hands-on experience with all major phases of the research process is provided, including surveying the existing literature, developing research hypotheses, collecting and analyzing data, and reporting the results in manuscript form. (Fall and Spring)

266. Research Laboratory in Social Psychology. Individual behavior in social contexts with selected experiments, which illustrate research methods and techniques. Prerequisites: CSP 161 and Introductory Statistics. (Fall and Spring)

351. Research in Developmental Neuropsychology. This course provides guided, direct research experiences in developmental neuropsychology, with a particular focus on autism and other developmental disabilities. (Fall)

352. Research in Developmental Neuropsychology. A continuation of 351. (Spring)

356. Research in Adolescent Development. This course provides guided, direct experiences with research on adolescent development, with a particular focus on adolescence in the context of family relationships.

373 and 374. Exploring Research in Social Psychology. First-hand team experience with ongoing research in social psychology areas. (Fall and Spring)

377. Exploring Research in Family Psychology I. Provides guided, direct, research experiences in investigating the interplay between family relationships and children's social and emotional development. Emphasis is placed on gaining knowledge in translating theories (e.g., family systems theory) into empirically testable hypotheses and designing research methods and techniques to test predictions. (Fall)

378. Exploring Research in Social Psychology II. A continuation of 377. (Spring)

384. Practicum in Developmental Disabilities I. Explores educational, therapeutic, and social challenges in developmental disabilities. Students spend approximately eight hours per week in a supervised educational or treatment setting as well as participate in weekly meetings to review and discuss general issues in the field. (Fall)

385. Practicum in Developmental Disabilities II. A continuation of 384. (Spring)

388. Research Practicum in Developmental Psychopathology I. Experience in conducting research in the area of developmental psychopathology involving patterns of development in high-risk children. (Fall)

389. Research Practicum in Developmental Psychopathology II. A continuation of 388. (Spring)

390. Supervised Teaching in Psychology. Teaching of topics in psychology within a regular course under an instructor's supervision. (Fall and Spring)

391. Independent Studies in Psychology. Supervised research on topics in psychology. May be repeated. An Independent Studies Fair is held at the beginning of each semester to facilitate linkages between students and researchers. (Fall and Spring)

392. Practicum in Psychology. Supervised reading and experience in an applied setting. Essential supervision by a University instructor only. (Fall and Spring)

394. Internship in Psychology. Experience in an applied setting supervised on site. Approved and overseen by a University instructor. Limit: two internships in program. Internships are generally developed by student initiative and often grow out of volunteer experiences from which they are differentiated by a time requirement and academic content and credit. The general guidelines are 8–12 hours per week at the internship site; scheduled, periodic conversations with a faculty member about content and progress; and a final summary paper. (Fall and Spring)

SPECIAL COURSES INCLUDING HONORS COURSES

100. Psychology Here and Now. An orientation to courses, research, and other activities of psychology at the University of Rochester.

309. Honors Seminar. A survey of the range of research conducted by department faculty. Involves planning for engaging in thesis research and the consideration of research design and presentation issues. (Spring)

310–311. Honors Research I and II. Development and conduct of research leading to the honors thesis. (Fall and Spring)

LECTURE COURSES

262. Human Motivation and Emotion.

A study of the motivational and emotional processes and theories that underlie both adaptive and maladaptive behavior. Includes

consideration of research largely with human subjects. (Spring)

263. Relationship Process and Emotions. Relationships are among the most important endeavors of human activity. In the past two decades, extensive theory and research has been devoted to understanding the processes of regulating people's thoughts, feelings, and behavior in meaningful relationships with friends, family, and romantic partners. The purpose of this seminar is to explore this literature. Psychological research on such important topics as attachment, emotion, intimacy, conflict resolution, relationship differences and similarities, and the impact of relationships on physical health and emotional well-being are examined (as well as other topics that may arise). (Fall)

264. Industrial and Organizational Psychology. Applications of psychological theory and research in work settings. Topics include personnel selection, training and appraisal; organizational structure and transformation; performance in work groups; motivation and satisfaction; leadership; work conditions; and cross-cultural issues. (Fall)

267. Psychology of Gender. Exploration of the ways males and females differ in interaction, theories of development of sex differences, consequences for social change. (Fall)

276. Psychology of Parenting. Parenting and family life are emphasized from developmental, ecological, and cross-cultural perspectives. Caregiving in diverse family forms and cultures is studied in relation to adult-child interactions, parent/school/community relations, family roles, laws, and parenting skills. Issues related to aspects of diversity in contemporary families are included. Prerequisite: PSY 171. (Fall)

278. Adolescent Development. This course surveys theory and research relating to normal development during adolescence. Adolescent development is examined in a variety of contexts, including families, peer groups, and schools, and issues pertaining to biological, social, and cognitive development are discussed. (Spring)

280. Clinical Psychology. An introduction to the field of clinical psychology. Students are exposed to prevalent theoretical and research models, as well as approaches and research findings to assessment and diagnosis, and treatment modalities. Prerequisites: PSY 101, PSY 282 or PSY 289. (Spring)

281. Psychology and the Law. This course provides an introduction and overview to the intersection between psychology and the legal system. Topics include forensic assessment, expert testimony, children and adolescents and the legal system, and the application of psychological science to legal issues. Prerequisite: PSY 101 is recommended. (Fall)

282. Abnormal Psychology. This course provides a conceptual overview to the field of psychopathology. Assessment and diagnosis, etiology, developmental course, treatment, and prognosis of the major psychological disorders are discussed. Current theory and research are emphasized. (Spring)

283. Behavioral Medicine. An overview of the application of behavior/lifestyle change approaches to the treatment of medical disorders, and the examination of interfaces between behavior and physiology. Topics include diabetes, cardiovascular risk factors, chronic pain, and cancer. (Spring)

289. Developmental Child Psychopathology. Presents theory, research, assessment, and intervention in child and adolescent psychological disorder. Contributions of the normal developmental perspective to understanding psychopathology and risk, and vice versa, are emphasized. (Spring)

SEMINAR COURSES

Prerequisites typically include prior coursework in the subarea and permission of the instructor.

301. Teaching Psychology. In-depth consideration of topics in psychology and their communication. PSY 101 is a lab for this course. Prerequisite: permission of instructor is required. (Fall)

361. Social Psychology: Self-Concept. Considers critical theories and research dealing with the processes of formation and change in the self-concept. This course is intended for advanced undergraduates and requires a major research paper, which should involve data gathering. During the first part of the course, students read classic and contemporary theory and research in the area. During the second part of the course students read in selected topics and present their original research proposal and results.

364. Achievement and Motivation. Seminar on achievement motivation, including achievement motives, achievement goals, and the strategies individuals use in achievement settings. (Spring)

366. Social Psychology and Control. Determinants and consequences of the need for control and perceived control, and their relation to individual and social behavior.

367W. Gender and Mental Health. This seminar examines the multiple ways in which gender-related factors impact mental health, from a biopsychosocial perspective. We discuss gender-related issues in assessment and treatment, as well as in the prevalence, etiology, course, and outcome of selected psychological disorders. (Fall)

368W. Seminar in Humanistic Psychology. An introduction to the theory and methods of humanistic psychology with particular emphasis on humanistic approaches to psychotherapy and growth. The approach is learning through experience. The class employs the methods of humanistic psychology, including demonstrations and experimentation. Assignments include regular reading and writing. Writings require the applications of theory to one's own life experiences. This is an upper-level writing course for all participants. (Fall)

371. Seminar in Social and Personality Development. Guided by a family systems perspective, this seminar explores children's social and emotional development within contexts of parent-child, interparental, and sibling relationships. Designed for advanced under-

graduate students, the course primarily covers research findings and theories and requires research proposal writing and class presentations.

375. Advanced Topics: Relationships and Emotions. This seminar course covers theory and research in the social psychology of relationships and emotions. Among the topics covered are attraction, theories of social interaction, relationship maintenance processes, emotional expression in relationships, and emotion regulation. Class format is discussion of published empirical studies and theories. Evaluation is based on written assignments, class participation, and an oral presentation. Students who enroll for the course should have experience reading articles from the psychological literature. Please note that the content of this course is intended to build on CSP/PSY 263. Prerequisite: CSP/PSY 263.

376. Seminar in Self-Determination. Deals with the field of human motivation with particular emphasis on intrinsic motivation and the meaning of self-determination in human functioning. A theoretically oriented course that reviews a range of research projects.

380. Theoretical Perspectives on Psychotherapy. This course focuses on foundational perspectives concerning human behavior change, including psychoanalytic, humanistic, behavioral, and social-cognitive approaches. Theoretical and practical issues concerning processes of motivation and behavior change in the contexts of child development, psychotherapy, medicine, and other applied fields are addressed.

381. Psychology of Developmental Disabilities. This course provides an introduction to the unique characteristics and challenges of individuals with developmental disabilities across the lifespan. We address the main concepts and issues involved in the identification, treatment, education, and support of children and adults with mental retardation and other developmental disabilities. We also explore current beliefs about intelligence, historical trends in society's perspectives on disabilities, and legal and ethical considerations. The class format includes both lecture and discussion. (Fall)

383. Moral Development. This seminar focuses on the psychological study of moral development. Different theoretical approaches to morality and related empirical research are discussed. The primary focus is from a developmental psychology perspective, but philosophical and educational issues also are considered. (Fall)

386. Advanced Emotional Development. Examines normative growth and individual differences in emotional development from birth through adolescence. Within each major developmental period, advances in the expression, regulation, and understanding of emotions is explored. The effects of culture and socialization practices on emotional development is emphasized.

396. Special Topics in Psychology. Consideration of recent experimental and theoretical contributions in several selected areas of psychology.

COGNITIVE SCIENCE

(See Brain and Cognitive Sciences, page 41.)

DANCE

The Dance Program at the University of Rochester is committed to offering theoretical and experiential study that honors and informs the whole student. It emphasizes the creative process, contemplative practice, the nature of community, diversity, somatic education, and an appreciation of diverse ways of thinking and moving. It explores the use of movement and dance as ritual, as spiritual practice, and as community-building, drawing from traditions and philosophies from all over the world.

We encourage students to validate their conceptual understanding through their own experience. This is called embodying knowledge, engaging ideas with the tools of our own experience. This is a crucial component of education—giving each individual the

opportunity to find a personal connection and resonance with intellectual material. When this happens, information is received and retained on a deeper level, and "academic" material can be taken beyond the classroom and applied to everyday life. This is the essence of much of the work in the classes: to use all the aspects of our study to attain a deeper understanding of ourselves and to enrich our experience of living embodied lives.

The Program offers a diverse set of courses that are carefully woven together to provide the students with diverse models of experiential learning and ways of thinking. The courses simultaneously emphasize sharing, cooperation, and self-reliance. Students are encouraged to be open and respect their immediate experience as a significant aspect of the educational process, and to tap into the resources they have: intellectual, emotional, artistic, intuitive, spiritual, and pragmatic. We lay the groundwork for them to become confident, articulate, highly creative, and compassionate leaders.

The program also sponsors the Performing Artist Series, which features lecture-demonstrations, workshops, and performances by internatio-nally and nationally acclaimed artists and educators who share their passion for the arts with the University and the surrounding community. Students are given an opportunity to interact with the guest artists and understand the issues that concern them. The focus of the series is to encourage discussion, stimulate the imagination, provide bridges between artistic and other disciplines, and to foster a learning environment composed of students, faculty, staff, and community.

Together, the academic and co-curricular components of the Dance Program give a foundation for ongoing learning and creative responsiveness throughout a student's life.

CLUSTERS

The Dance Program offers three clusters; each provides an in-depth view of a different area. For more information on the clusters, visit the program's Web site at www.rochester.edu/college/dance.

1. Improvisation and Creative Process (H1DAN006)
2. Movement and Culture (H1DAN007)
3. Mind-Body Somatics (H1DAN009)

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

101. World Dance: Movement as Culture. This lecture-based course is an exploration of world cultures through dance. Students expand their dance literacy through movement and embodied dance history. The course, therefore, investigates the historical and anthropological significance of dance as well as provides an experience of the movement qualities of different world cultures. In this connection, students examine dance as a kaleidoscopic reflection of humanity's basic instinct to communicate and, by extension, as an expression of world perspectives through movement. Specific attention to the cultures and dances of Japan, Nepal, India, Africa, North and South Americas, and Europe are investigated. The course includes movement classes, lectures, films, readings, discussions, guest artists, journal writing, and a final project.

102. Fundamentals of Movement A. Credit—2 hours. This course explores movement through the use of technique and improvisation. It emphasizes spontaneity, joy in moving, and self-awareness and is based on experiential anatomy and developmental movement patterns. It provides a strong foundation for further study in dance, theater, or sports, or it can be used as an introduction to movement and body awareness. No previous dance training is required.

103. Fundamentals of Movement B. Credit—2 hours. A continuation of DAN 102.

104. Contact Improvisation I. Credit—2 hours. Contact improvisation is rooted in dance, the martial arts, and studies of body development and awareness. It is a duet form where partners use weight, momentum, and inertia to move each other freely through space, finding support through skeletal structure rather than muscular effort. We explore solo and duet skills such as rolling, falling, balance, counter-balance, jumping, weight sharing, spirals, and attuning to sensory input. Skill work is combined with more open dancing in a supportive and focused environment. No previous dance training required.

105. Creative Improvisation Through World Percussion. Credit—2 hours. This class explores improvisation as a process and vehicle for personal expression while investigating some of the rhythms and music of the world through hands-on performance, guided listening, readings, and video presentations. The course provides an introduction to hand-drumming technique with an emphasis on West African and Afro-Cuban percussion traditions. Following the spirit of these traditions, which celebrate community over individualism, practical facility with drumming language is emphasized as a key to exploring improvisation. This course, in an overall sense, provides students with a first-hand experience of how music in general, and drumming in particular, joins people together in a shared experience of sound and vibration that is both ancient and contemporary.

114. Introduction to Anusara Yoga. Credit—2 hours. Anusara Yoga is a powerful system of hatha yoga that integrates a Tantric philosophy of intrinsic human goodness, Universal Principles of Alignment, and an artistic method of expressive movement. Stu-

dents learn to honor their unique differences and limitations, and through self-examination, discovery, and receptivity, they open to new ideas about their responsibility and individual roles in a rapidly changing world community. This class unifies traditional Indian philosophy with practical implementation, classic yoga asana (poses) with a creative movement application emphasizing a celebration of the heart. Course requirements include assigned readings, journaling, discussion, and participation in class and home practice.

116. Introduction to Contemporary Ballet. Credit—2 hours. Contemporary Ballet approaches ballet technique through the lens of somatic practices and focuses on giving students a strong technical base. Phrasing, musicality, and efficiency of movement are emphasized. The class provides a theoretical context, looking at ballet history and art and culture in society.

120. Introduction to Aikido.

Credit—2 hours. Aikido is a different kind of martial art. It doesn't rely on speed or strength, but on the development of a calm mind and a relaxed body. While the techniques learned in Aikido are fascinating and effective, Aikido's real secret is this strong, dependable mind/body state. In the class students are taught how to throw attackers effectively and almost effortlessly and how to fall safely. Aikido helps one to know oneself, to understand the natural rhythms of the human body, and to harness the true power of the mind and body for school, sports, dance, and all aspects of one's life.

171. Capoeira: Brazilian Art Movement. Credit—2 hours. An art form of self-defense with strong aerobic and dance elements that brings together a harmony of forces. Through the study of the history, movements, and
culture behind Capoeira, students gain self-
confidence, power, flexibility, endurance, and, ultimately, the tools toward self-discovery. Capoeira is within the reach of anyone, regardless of age, sex, or athletic experience. In keeping with its strong traditions, Capoeira balances the body, mind, and soul and enables one to break through limits, revitalizing oneself for everyday life.

180. Creative Middle Eastern Dance. Credit—2 hours. Unveils the grace and beauty residing in the creative nature of Middle Eastern dance. Improves strength, flexibility, and self-awareness of the body. Class work includes meditative movement, dance technique, improvisation, and rhythm identification through music and drumming. Specific dance forms such as Egyptian and Turkish Oriental, Tunisian, American Tribal, and Folkloric/Bedouin styles of North Africa are taught. Discourse and research topics explore issues of gender, body image, historical perspectives, and Orientalism.

181. West African Dance Forms I. Credit—2 hours. Students experience dancing African styles from the traditional cultures of Ghana and Guinea in West Africa. Technical emphasis focuses on foot patterns and placement as well as developing the proper physical stance for African dance styles. Students practice the dances and drum songs called Kpanlogo and Gota from Ghana; Yankadi, Makru, and Kuku from Guinea; as well as various other selections. Outside work is required, including performance attendance, video viewing, article analysis, and journaling. Students can expect to gain a broadened perspective of contemporary West Africa and its cultural practices.

203. Contact Improvisation II. Credit—2 hours. A continuation of DAN 104 that is taught concurrently with the introductory course. Students in DAN 203 gain a deeper experiential and intellectual knowledge of contact by exploring issues further. Work includes both more advanced practices with other 203 students, and the experience of helping teach the 104 students the basic principles of contact.

204. Contact Improvisation and Culture. This course includes the studio work of the 2-credit contact improvisation course, and readings and written assignments that use ideas from contact improvisation to explore cultural issues.

206. Experiential Anatomy and Embodied Practices. This class threads together imagination, metaphor, and embodiment into a single, unified process, taking to heart Andrea Olsen's conviction that language can point toward but does not replace experience. To this end, we explore a wide range of parallels to be found among ancient and contemporary movement and healing practices from the Orient, Africa, Europe, and North America. Along the way, primary focus is placed on processes of embodied learning glimpsed through direct experiences, bodywork techniques, movement styles, and meditation/visualization methods from around the world. Students can thus expect a holistic exercise experience rooted in a coordinated course of readings and journal writing, which culminates in a personal research project.

208. T'ai Chi and Chinese Thought. Credit—2 hours. A study of Taijiquan, (also known as T'ai Chi Ch'uan or Tai Chi), a traditional Chinese martial art, and its intimate relationship to the cosmological, physiological, and philosophical conceptions found in the culture and thought from which it emerged. The course investigates both the traditional Chinese philosophy and movement aspects of Tai Chi in order to better understand the integration of human body, mind, and spirit. The Simplified 24-Step Taijiquan (Ershisi Shi Taijiquan) is learned, along with the foundation skills of the Eight Methods or Energies (Ba Fa), Reeling Silk (Chan Si Gong), Pushing Hands (Tui Shou), and Standing Pole meditation (Zhan Zhuang). Tai Chi is not only a valuable cross-training exercise for the dancer, but also provides training for relaxed strength, whole-body coordination, balance, centered alignment, timing, weight shifting, and moving with fluid grace.

209. Qi Gong: Chinese Way to Health. Credit—2 hours. Qi Gong is a traditional
Chinese internal art and an early forerunner of Tai Chi Ch'uan consisting of the practice (Gong) of sets of energy (Qi) exercises to build outer and inner strength. It is a self-healing modality designed to balance and harmonize the energy flow of the body, improve breathing, and relax the mind for health, fitness, and longevity. This course is a study of both the philosophical and the movement

aspects of Qi Gong in order to better understand and to attain the integration of body, mind, and spirit. Topics include traditional Chinese cultural concepts such as Yin-Yang theory, Five Element theory and Qi theory. Qi Gong provides the dancer with training for better breathing, body awareness, focus and concentration, mental presence, imagery, and cultivating and expressing energy.

211. T'ai Chi: Explorations in Qi. Dancers, musicians, actors, painters, philosophers, poets, warriors, healers, and artists of every discipline historically have utilized the Chinese internal arts of Tai Chi and Qi Gong as tools for the mobilization of qi, or energy, in order to achieve health, healing, and mind-body-spirit integration. This course combines movement, meditative, and breathing exercises and traditional forms with readings, video viewings, creative exercises, exploratory projects, and discussions of literature and philosophy to explore how the practice and philosophy of these transformative arts can lead to mental and physical balance, body-mind integration, self-discovery, creative expression, and peak athletic and enhanced artistic performance.

217. Body as Medium: Performance Art. Credit—2 hours. This class introduces students to performance art as a four-fold discipline: a powerful cultural practice that has a long and storied history; a contemporary means of expression that remains both vibrant and volatile; a powerful tool for investigating and reflecting on ways that individuals choose to construct representations of their self/selves; and a path leading toward a meaningful social, political, and ecological engagement with the world. Among other things, we consider how one's history, gender, race or ethnic identification, personal geography, sexuality, and bodily expression can all be considered elements in the ongoing performance of one's life. Students, presented with daily warm up, group, and individual exercises, learn to develop collaborative and individual pieces that explore embodiment as an artistic medium.

218. Dance and Community. Credit—2 hours. Dance has played a part in communities for centuries. The relationship between dance and community from various perspectives and from around the globe is examined through readings and film. Students explore the meaning of community while creating a group performance piece together, which revolves around themes of social awareness and active citizenship. Whether the function of dance is recreation, courtship, social change, performance, or appealing to supernatural forces, this course offers a wide-ranging examination of dance's role in many settings.

220. Sacred Dance. Credit—2 hours. This class explores what sacred dance is and how the sacred can be revealed from within through the study and practice of the following topics: a dance history overview, goddess worship and the feminine spirit, the women iconoclasts of American modern dance, spirituality and the body temple, and various yoga practice techniques. Students also learn traditional dance sequences from Namibia, India, Israel, Greece, and the Middle East; creative community circle dancing; and dances of Universal Peace. Class requirements include journaling, reading assignments from the textbook and handouts, viewing videos, and attendance at dance events.

265. Contemporary Dance Technique A. Credit—2 hours. This class is for students with previous dance or athletic experience. It blends the challenges of full-bodied, momentum-driven dancing with a sense of one's own self-awareness and discovery. Classes explore efficiency of movement, breath, gravity and weight, musicality, performance, and somatic practices. Through rigorous dancing, students are challenged to move beyond not only their physical, but also their artistic boundaries and dimensions.

266. Contemporary Dance Technique B. Credit—2 hours. This course is a continuation of DAN 265 and is taught concurrently with the introductory course. Students in DAN 266 deepen and refine the techniques learned in the previous semester.

271. Capoeira II: Music and Motion II. Credit—2 hours. This is a deeper study of Capoeira. This second level finds students continuing to build strength, coordination, rhythm, and balance. Students also become further involved with the instrumentation of Capoeira. Readings and discussions explore historical events and look at Capoeira and its Afro-Brazilian spirituality, liberation, and cultural revolution throughout the ages. Each class involves daily physical and music training.

281. West African Dance Forms II. Credit—2 hours. This course focuses on the increasingly complex dance repertoires of Ghana and Guinea in West Africa. A more specified investigation of regional context and cultural function of the dances is emphasized. Repertoire dances include Sinte, Kassa, Yamama, and Somuninku from Guinea and Adowa, Slow Agbekor, and Gahu from Ghana, as well as others. Enrollment requires West African Dance 1 or demonstrated ability in African dance.

EARTH AND ENVIRONMENTAL SCIENCES

Asish R. Basu, Ph.D. (California, Davis)
Professor of Geology
Cynthia J. Ebinger, Ph.D. (M.I.T.) *Professor of Geology*
Udo Fehn, Ph.D. (Munich) *Professor of Geology; Chair of the Department*

Gautam Mitra, Ph.D. (Johns Hopkins)
Professor of Geology
Robert J. Poreda, Ph.D. (California, San Diego) *Professor of Geology*
John A. Tarduno, Ph.D. (Stanford) *Professor of Geophysics and of Physics*
Carmala Garzione, Ph.D. (Arizona) *Associate Professor of Geology*
Lawrence W. Lundgren, Jr., Ph.D. (Yale)
Professor Emeritus of Geology
Robert G. Sutton, Ph.D. (Johns Hopkins)
Professor Emeritus of Geology

The Department of Earth and Environmental Sciences offers five distinctive degree programs and provides its students with excellent opportunities for communicating and working with its faculty members and graduate students, both in and outside of the classroom. Each of the degree programs has been designed to serve special interests of the students and the particular demands associated with professional work in various areas of the earth sciences.

The degree programs consist of the B.A. in geological sciences, the B.S. in geological sciences with concentrations in geology, geochemistry or geobiology, the B.S. in geo-mechanics (GEM), the B.A. in environmental studies, and the B.S. in environmental sciences. The three B.S. programs are designed to give students the background for graduate work and professional careers in the earth and environmental sciences, and in those areas in which the earth sciences overlap with the life sciences or with engineering. The two B.A. programs are designed to allow more flexibility in program design and are pursued not only by students preparing for graduate work in the earth sciences but also by students interested in law, management, or teaching. The department also offers minors in geological sciences and environmental geology.

The department considers field experience to be a valuable part of geological training and incorporates field trips into the regular schedule of many of the undergraduate courses. Students take excursions within New York and adjoining states or can participate in a course that provides field experience studying active geological processes in California.

Faculty encourage advanced undergraduates to participate in North American and overseas field research programs. Most undergraduates participate in active laboratory research in fields such as geophysics, geochemistry, paleontology, petrology, structural geology, tectonics, seismology, stratigraphy, geodynamics, magneto-stratigraphy, geology, public policy, paleoclimate studies, and environmental geology.

The Undergraduate Student Geological
Organization (USGO) is an active student-led organization that provides special field trips, speakers from other universities and colleges, and social events throughout the academic year.

Graduate work and careers in most fields demand a broad general background in the basic sciences and mathematics, and students are strongly advised to take courses beyond the minimum requirements in these subjects. All students are encouraged to gain a proficiency in reading scientific material written in foreign languages.

At least two courses are required to fulfill the department's upper-level writing requirement. A list of courses and a description of the requirement can be found in the Earth and Environmental Sciences' Upper-Level Writing Requirement document available online or in the department office.

STRUCTURE OF DEGREE PROGRAMS

Each of the five degree programs and the suggested paths or tracks are outlined below.

MINIMUM REQUIREMENTS FOR THE B.A. IN GEOLOGICAL SCIENCES

Required Courses

- MTH 161 or MTH 141–142 (calculus AP credit is acceptable)
- PHY 121 (physics AP credit is acceptable)
- CHM 131 (chemistry AP credit is acceptable)
- One other course in related sciences (mathematics, physics, chemistry, biology, or statistics)

Geology Core Courses

- EES 101. Introduction to Geological Sciences
- EES 201. Evolution of the Earth
- EES 203. Sedimentology and Stratigraphy
- EES 204. Mineralogy

• EES 208. Structural Geology

Technical Electives
Three technical electives should be chosen to create what the student and faculty advisor(s) view as a coherent program. Any EES courses at the 200 level or higher are acceptable. One 100-level EES course may be acceptable if it was taken in the first year.

MINIMUM REQUIREMENTS FOR THE B.S. IN GEOLOGICAL SCIENCES

Required Courses
- MTH 161, 162, 163, or MTH 141–143, 163 (calculus AP credit is acceptable)
- PHY 121 (113 for geobiology track) (physics AP credit is acceptable)
- PHY 122 (114 for geobiology track) (physics AP credit is acceptable)
- CHM 131 (chemistry AP credit is acceptable)
- CHM 132 (chemistry AP credit is acceptable)

Geology Core Courses
- EES 101. Introduction to Geological Sciences
- EES 201. Evolution of the Earth
- EES 203. Sedimentology and Stratigraphy
- EES 204. Mineralogy
- EES 208. Structural Geology

Geology Track Required Courses
- EES 206. Petrology and Geochemistry
- EES 205. Geophysics

or

- EES 207. Invertebrate Paleontology
- EES 211. Earthquakes and Volcanic Hazards

SUGGESTED COURSE SEQUENCE FOR B.S. IN GEOLOGICAL SCIENCES

GEOLOGY TRACK

First Year

MTH 161	MTH 162
CHM 131	PHY 121 or
EES 101	CHM 132
Writing or Elective	EES 201
	Elective

Second Year

MTH 163	CHM 132 or
PHY 122 or Elective	PHY 121
EES 208	EES 204
EES 207 or EES 205	Elective
	Technical Elective

Third Year

PHY 122 or Elective	EES 240
EES 203	Elective
EES 206	Elective
Technical Elective	Technical Elective

Fourth Year

EES 391	EES 393
Technical Elective	Elective
Elective	Elective
Elective	Elective

Field Course
This requirement may be satisfied by participating in a 6–8 week summer field course in geology, or by undertaking supervised fieldwork (EES 299) with approval of the advisor.

Technical Electives
Four technical electives in EES should be chosen to create what the student and the faculty advisor(s) view as a coherent program that leads to an advanced understanding of the earth sciences. One 100-level EES course may be acceptable if it was taken in the first year. Technical electives should be courses distinct from required courses in the track.

Senior Thesis
In addition to the above courses, students are encouraged to undertake a research project culminating in a thesis written in the senior year (EES 393).

GEOCHEMISTRY TRACK
Required Courses
- EES 206. Petrology and Geochemistry
- Two courses in geochemistry chosen from the following:
  EES 217. Physical and Chemical Hydrology
  EES 218. Chemistry of Global Change
  EES 248. High Temperature Geochemistry

Field Course
This requirement may be satisfied by participating in a 6–8 week summer field course in geology, or by undertaking supervised fieldwork (EES 299) with approval of the advisor.

Technical Electives
Three technical electives in EES or CHM should be chosen to create what the student and the faculty advisor(s) view as a coherent program that leads to an advanced understanding of the earth sciences. One 100-level EES course may be acceptable if it was taken in the first year. Technical electives should be courses distinct from required courses in the track.

Senior Thesis
In addition to the above courses, students are encouraged to undertake a research project culminating in a thesis written in the senior year (EES 393).

GEOBIOLOGY TRACK
Required Courses
- BIO 110. Principles of Biology I (biology AP credit is acceptable)
- BIO 111. Principles of Biology II
- STT 212. Applied Statistics for the Bio-logical and Physical Sciences I
- EES 207. Invertebrate Paleontology

Field Course
This requirement may be satisfied by participating in a 6–8 week summer field course in geology, or by undertaking supervised fieldwork (EES 299) with approval of the advisor.

Technical Electives
Two technical electives in EES or BIO should be chosen to create what the student and the faculty advisor(s) view as a coherent program that leads to an advanced understanding of the earth sciences. One 100-level EES course may be acceptable if it was taken in the first year. Technical electives should be courses
distinct from required courses in the track.

Senior Thesis
In addition to the above courses, students are encouraged to undertake a research project culminating in a thesis written in the senior year (EES 393).

REQUIREMENTS FOR THE B.S. IN ENVIRONMENTAL SCIENCE

The B.S. in environmental science provides a broad basis in the natural sciences and their applications to processes and problems in the environment. This degree is intended for students who are interested in a career in environmental research. Students going through this program will be able either to seek employ-ment directly or to go to programs that offer advanced degrees in environmental science.

Basic Courses

- BIO 110, 111
- CHM 131, 132, 203, and 207
- EES 101
- MTH 161, 162 (or 141–143), and 163 or 165
- PHY 113/121, 114/122

Core Courses

- EES 103, 215, 217, and 218

Technical Electives

Three technical electives are required, chosen from tracks in biology, chemistry, or geology. Courses in this category are selected from a list of approved courses by the student in consultation with a faculty advisor. The program is completed with two closure courses (8 credit hours), which consist either of a senior thesis or a combination of internship, practicum, and seminar in the environmental sciences.

REQUIREMENTS FOR THE B.A. IN ENVIRONMENTAL STUDIES

The B.A. in environmental studies combines courses necessary for the basic understanding of processes in the environment with courses dealing with theories of economics and political science. This program is intended for students who are interested in the economic and political consequences of problems in the environment. Students who complete this program typically go into fields such as environmental law or public policy.

Basic Courses

- BIO 110 or 111
- CHM 131
- EES 101
- MTH 161 (or 141 and 142)

Core Courses

- EES 103, 215, 217 or 218

Elective Courses

Elective courses come from two groups: natural sciences and social sciences. A total of seven elective courses is required (three or four from either group), to be chosen from a list of approved courses by the student in consultation with a faculty advisor. In addition, one course in statistics, mathematics, or computer science is required. The program is completed with a closure course that will be either a senior thesis, internship, or suitable seminar.

B.S. IN GEOMECHANICS

A four-year program in geomechanics is offered jointly with the Department of Mechanical Engineering for students interested in the application of the field of mechanics to problems associated with the atmosphere, rivers, lakes and oceans, and the solid earth. Students successful in this program will be well equipped for graduate work in a variety of fields, including geophysics, hydrology, structural geology and rock mechanics, engineering geology, limnology, and coastal and marine geology. (See also a description of the program in the section on Interdisciplinary Programs, Edmund A. Hajim School of Engineering and Applied Sciences.)

REQUIREMENTS

- MTH 161, 162 (or 141–143), 163, and 164
- PHY 121, 122, 123
- CHM 131
- EES 101, 201, 204, and 208

- ME 120, 123, 225, 226, and either 241 or 242

In addition to the above courses, there are four technical electives, which may be any of the EES or ME courses at the 200 level or higher, and one technical elective from any discipline, as agreed upon with the faculty advisor. The program includes three free electives to allow a strong minor in an area of particular interest to the student, or to broaden the scope of the curriculum.

REQUIREMENTS FOR A MINOR IN GEOLOGICAL SCIENCES

Six courses are required:

- EES 101. Introduction to Geological Sciences
- EES 201. Evolution of the Earth
- Any four of the following:
  EES 203. Physical Sedimentology
  EES 204. Mineralogy
  EES 205. Geophysics
  EES 207. Principles of Paleontology
  EES 208. Structural Geology
  EES 241. Igneous and Metamorphic Petrology

A student taking this minor will have a broad grasp of geology and will be able to build upon it as a solid foundation for a major should his or her career plans change.

REQUIREMENTS FOR A MINOR IN ENVIRONMENTAL GEOLOGY

Six courses are required (three specified and three electives).

- Specified:
  EES 101. Introduction to Geological Sciences
  EES 103. Introduction to Environmental Science
  EES 215. Environmental and Applied Geophysics
- Choose three courses from the following list:
  EES 201. Evolution of the Earth
  EES 203. Sedimentology and Stratigraphy
  EES 204. Mineralogy
  EES 208. Structural Geology
  EES 211. Earthquake and Volcanic Hazards: Living on an Active Planet
  EES 217. Physical and Chemical Hydrology
  EES 218. Chemistry of Global Change
  EES 219. Energy and Mineral Resources

The environmental geology minor is intended especially for natural-science and social-science concentrators who are planning on further study or employment in environmental fields.

UPPER-LEVEL WRITING REQUIREMENT

At least two courses are required to fulfill the department's upper-level writing requirement. A list of courses and a description of the requirement can be found in the Earth and Environmental Sciences' Upper-Level Writing Requirement document available on-line or in the department office.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

101. Introduction to Geological Sciences. This introductory geology class provides a broad overview of the earth sciences, from planetary evolution to the interplay of geology and climate. The course is a prerequisite for all undergraduate majors who are considering careers in the earth and environmental sciences, while also satisfying science requirements for other undergraduate majors.

The class begins with the unifying framework for earth science: plate tectonics. Throughout the semester the course looks at the physical interactions between different realms on Earth, including the interior (core and mantle), the outer shell (termed lithosphere), oceans, and atmosphere. Also explored are the dynamic processes operating on Earth and how these processes have been recorded and have varied over the geologic history. During the last third of the semester, discussion revolves around geologic problems that have a particular relevance to humans, such as energy and mineral resources, water resources, climate, and global change. Students are required to enroll in a lab section and are required to attend one field trip. (Fall)

102Q. Earthquakes, Volcanoes, and Mountain Ranges in California: A Field Quest. Understanding how the Earth works starts with an appreciation of geological processes in action. To observe these dynamic processes, such as earthquakes, volcanic eruptions, and mountain formation, Earth scientists must travel to areas of geological youth, such as California. In this Quest, students are introduced to active geology through readings and discussion sections in preparation for a field excursion to California. Students learn how to examine critically ideas on how Earth science systems work and how active processes affect society. Prerequisite: EES 101 or permission of instructor. (Spring)

103. Introduction to Environmental Science. An introduction to the natural, physical, chemical, biological, and geological processes that shape conditions at the Earth's surface, their interrelationships, and the modification of these processes by human activity. Students learn to critically analyze scientific hypotheses and the data on which they are founded. Exercises in the field and laboratory reinforce basic concepts introduced in the lecture, and introduce students to some basic methods of environmental research. The content of this course is similar to that of the AP environmental science curriculum. (Spring)

104Q. Environmental Quest in the Field and Laboratory. In this quest, small groups of students (about 4 per group; maximum of 12) conduct an environmental investigation of an actual field site in the Rochester area. Through a series of experiments involving field mapping, sampling, laboratory analysis, and data interpretation, students attempt to achieve an understanding of a specific environmental problem. The coordination of the laboratory experiments allows students to build on skills learned in previous sessions and to recognize the linkages among a variety of investigative approaches. The semester culminates with the presentation of the results in a departmental forum.

106. Meteorites and Impact Craters. An introduction to the geology of the solar system from the perspectives of earth science and the fascinating world of meteorites, asteroids, comets, and impact craters. Special emphasis is on the meteorite evidence for our understanding of planetary formation, the role of impacts and mass extinction, and the origin of the moon.

119. Energy and Mineral Resources. Mineral deposits; the geologic processes related to their formation, geologic setting, distribution, and use. Formation of fossil fuels. Technical principles of today's major energy sources, their availability and future potential. Alternative energy sources (e.g., solar energy, geothermal energy). Environmental and economic consequences of energy use. Note: juniors and seniors in the natural sciences and engineering are required to enroll in EES 219. (Spring)

201. Evolution of the Earth. Historical geology encompasses the (1) dynamic history of the physical earth: the development of land forms, rise and fall of ancient seas, movements of continents, etc., and (2) the evolution of historical geology such as paleontology, sedimentology, stratigraphy, geochronology, and plate tectonics, and a chronological survey of earth and life history, emphasizing the evolution of North America. (Spring)

202Q. Plate Tectonics and Active Geologic Processes in California. Understanding how the Earth works with an appreciation of geological processes in action. To observe these dynamic processes such as earthquakes, volcanic eruptions, and mountain formation, Earth scientists must travel to areas of geological youth, such as California. In this course, students are introduced to active geology through readings and discussion sections in preparation for a field excursion to California. Students learn to examine critically ideas on how Earth science systems work and how active processes affect society. This course is the complement to EES 102Q and is intended for geology and environmental science majors.

203. Sedimentology and Stratigraphy. Sediments and sedimentary rocks cover or underlie much of the Earth's surface. In them are recorded both evidence of the processes responsible for shaping the planetary surface and the record of life. Sedimentary rocks contain enormous volumes of water; solid and fluid hydrocarbons, as well as other natural resources. Sediments and sedimentary rocks are very important to our way of life, and they are fascinating in and of themselves. This course describes and classifies sedimentary rocks towards understanding the processes that shape them and the environments in which they form. Prerequisites: EES 101 and 201. (Fall)

204. Mineralogy. Lectures discuss the physical and chemical principles governing the properties and formation of minerals. There are three major divisions of the subject matter: (a) geometric and optical crystallography; (b) crystal chemistry and properties of minerals, and (c) occurrence, origins, and pressure-temperature stabilities of the major rock-forming minerals. Laboratories are devoted to exercises in crystallography, X-ray diffraction, optical mineralogy, and hand-specimen mineral identification. Prerequisite: EES 101 or permission of instructor. (Spring)

205. Geophysics. Introduction to geophysical methods and their application to Earth structure from surface to core. Topics include seismology and Earth structure, gravitational field, geochronology and age of Earth, heat generation and heat flow, heat production,

radioactivity and mantle convection, magnetic field, paleomagnetism, bending and deformation of continental and oceanic plates, geophysical methods applied to archeology, and environmental studies. Prerequisites: MTH 141/161, PHY 114 or equivalent, EES 101. (Fall)

206. Petrology and Geochemistry. Distribution, description, classification, and origin of igneous and metamorphic rocks in the light of theoretical-experimental multicomponent phase equilibria studies; use of trace elements and isotopes as tracers in rock genesis; hand specimen and microscopic examinations of the major rock types in the laboratory.
Prerequisite: EES 101.

207. Principles of Paleontology. This course is designed to introduce the basic principles of paleontology—the study of fossil organisms in the geological record. Topics covered include taphonomy and the processes of fossilization, principles of evolution as evidenced by the fossil record, taxonomy and the recognition and naming of fossil species, biostratigraphy as a means of dating a rock and/or learning about ancient environments, geochemistry of fossils as a means to understand ancient habitats and behaviors. This course includes an overview of important fossil groups with hands-on experience and a field. trip. Prerequisite: EES 101 and EES 201 or permission of instructor. (Fall)

208. Structural Geology. Recognition and interpretation of geologic structures. Topics include geometric analysis of faults, folds, joints, and rock fabrics; an introduction to stress analysis, theories of brittle failure, finite strain analysis, ductile deformation, application to geotectonics. Laboratory work concerned with structural analysis. Prerequisites: EES 101, 201, 204. (Fall)

211. Earthquake and Volcanic Hazards: Living on an Active Planet. Earthquakes and volcanic eruptions are violent manifestations of plate tectonics, the movement of the relatively rigid plates forming the Earth's outer shell. This course focuses on the causative mechanisms of earthquakes and volcanoes, hazard mitigation and forecasting, and insights into planetary processes gained from their study. The final third of the course examines particular events on Earth, with implications for planetary evolution in general. Prerequisite: EES 101 or permission of instructor. (Spring)

214. Environmental Geology. Examines the geological processes that shape our surface environment. Topics focus on the interactions between natural processes (e.g., volcanic eruptions; earthquakes; glaciers; fluvial, coastal, and groundwater systems) and the changing human environment. Prerequisite: EES 101. (Fall)

215. Environmental and Applied Geophysics. This course aims to image the internal structure of the oceans and continents using geophysical methods. Topics include physical processes occurring within Earth's plates, including solar and internal energy sources, movement of fluids in the oceans, and plates. Geophysical methods used to detect these processes and to constrain physical properties, including seismic, electromagnetic, and gravity as measured from surface, subsurface, and satellites. Laboratory examples include environmental site remediation, hydrocarbon and mineral exploration, archeological remote sensing, tsunami detection, and groundwater exploration.
Prerequisites: EES 101, MTH 142/162.

217. Physical and Chemical Hydrology. This course provides a foundation in both qualitative and quantitative analyses of the dynamic interaction between water and geologic media. The first part of the course outlines the formation of water, atmospheric processes, and the hydrologic cycle. The second part focuses on the theory of, and geologic controls on, groundwater flow. The third and final part of the course deals with natural groundwater geochemistry and environmental conta-mination. Prerequisite: EES 101. (Spring)

218. The Chemistry of Global Change. A quantitative survey of the processes controlling environmental conditions at the Earth's surface today, how they have changed with time, and how they are expected to change in the future. The course emphasizes the chemical composition of the atmosphere and oceans, and the chemical, biological, and geological processes that affect this composition. Specific topics include greenhouse gases and global warming; photochemistry and stratospheric ozone; geochemical cycles and feedbacks; the effects of human activities; and the methods used to study the chemical evolution of the atmosphere and oceans through time. Prerequisites: CHM 131–132 or 151–152, MTH 162; recommended: EES 101 and 103, MTH 163. (Fall)

219. Energy and Mineral Resources. Same as EES 119, but with more emphasis on science background in separate readings and discussion section. Intended for students in sciences and engineering. (Spring)

241. Igneous and Metamorphic Petrology. Lectures cover an overview of igneous and metamorphic petrology. Origin and distribution of the major igneous-metamorphic rocks in the light of experimental and theoretical multicomponent phase-equilibria studies are the major topics of the lectures. Trace element distribution and isotopes as petrogenetic tracers in the evaluation of the crust-mantle system also are covered in the lectures. Laboratories are devoted to description, identification, and significance of mineral assemblages in these rocks as observed in hand-specimens and under the petrographic microscope. Prerequisites: EES 101, 204, 240 or permission of instructor. (Spring)

248. High-Temperature Geochemistry. An introduction to the principles of geochemistry. The first portion of the course is devoted to basics, especially thermodynamics and isotope (both stable and radioisotopes) geochemistry. The middle portion of the

course deals with high-temperature processes and crystallization. The last part of the course covers lower temperature processes including weathering, sediment diagenesis, and element cycling through the lithosphere. Prerequisites: EES 101, CHM 103. (Fall)

251. Introduction to Remote Sensing and Geographic Information Systems. Students learn the basic principles of satellite, airborne, and other remote sensing data acquisition systems and the processing and interpretation of acquired data sets. Case studies and computer-based practicals focus on visible to near-infrared, thermal, and radar imaging of continents and seafloor. Course material includes a review of geographic coordinate systems and projections for georeferencing remotely sensed data as a basis for Geographic Information Systems analysis. Assessment is through computer-based practicals and short-answer, mid-term exam.
Prerequisites: MTH 141–143 or MTH 161–163. (Spring)

252. Marine Geology. This course provides a comprehensive review of modern marine geology with an emphasis on the deep sea. Areas identified by the international ocean drilling community as of high research priority are discussed, including new techniques used to study such problems. Four subject areas are discussed: the lithosphere, tectonics, ocean history and sedimentary geochemistry, and physical processes. Prerequisite: EES 101. (Spring)

253. Geodynamics. Processes that create and modify Earth and the terrestrial planets are examined using an "earth engineering" approach. Emphasis is placed on plate tectonics, with discussion of current research in mantle convection. The final third of the course focuses on active plate tectonic boundaries and evidence for plate tectonics on Mars and Venus. Prerequisite: EES 201 or permission of instructor (Fall)

255. Planetary Science: Geologic Evolution and Planetary Habitability. This course focuses on geologic and geophysical studies of planets (interiors and surfaces), and the conditions that led to the origin of life. Starts with initial conditions, defined here as the formation of Earth and the Moon-forming event, and trace development of the planet from cooling of the magma ocean onwards. Next the course considers how our planetary neighbors (Venus and Mars) evolved, as well as key satellites in the solar system that may harbor life or provide insight into early conditions on Earth. Prerequisite: EES 101 or EES 201 strongly recommended. (Fall)

256. Paleomagnetism and Global Plate Tectonics. The basic paleomagnetic methods used to determine absolute plate motions are reviewed. Applications include the potential cause and effect relationship between changes in absolute plate motions, mantle plume volcanism, orogeny, and climate change. Prerequisite: EES 101. (Alternate Springs)

257. Topics in Advanced Seismology. This course examines wave propagation in the Earth and introduces helioseismology. Classes focus on theory of waveform modeling, moment tensor inversions, low-frequency earthquakes, and related topics. Laboratory work focuses on Matlab-based programming. Prerequisites: PHY 122 or equivalent, EES 205. (Spring)

258. Hotspots and Plate Motions. The course provides a basic understanding of hotspot models, hotspot fixity, and the relationships between hotspots, mantle plumes, true polar wander, and plate motions. Hypothesis development and testing are discussed, as are the basic elements of grantsmanship. Prerequisite: EES 101 or equivalent. (Spring)

259. Seminar in Paleomagnetism. Current topics in paleomagnetism and rock magnetism are explored through literature reviews and modeling studies. Topics range from the history of plate tectonics to biogenic magnetism. An introduction to basic concepts in paleomagnetism and rock magnetism is included. Prerequisite: EES 101 or permission of instructor.

264. Paleoenvironmental Reconstructions Using Light Stable Isotopes. This class focuses on techniques used in environmental reconstructions to address questions related to paleoclimate, paleotemperature, paleovegetation, and paleoelevation. The course examines the use of stable isotopes in paleoenvironmental reconstructions with particular emphasis on O, C, and to a lesser extent H and N isotopes. The course starts with a thorough introduction of the geological framework of the environments of interest and the processes of light isotope fractionation. This is followed by "emphasis areas" that highlight the basics and latest developments in a variety of environmental systems, including the oceans, rivers, ice, lakes, soils, and fossils. Prerequisites: EES 101 or 103. Open to juniors and seniors. (Fall)

269. Stable Isotopes in Geochemistry. This course examines the distribution of the stable isotopes of hydrogen, carbon, oxygen, and nitrogen in biological sedimentary, metamorphic, and igneous processes. Prerequisites: EES 248, 467, or permission of instructor. (Spring)

270. Vertebrate Paleontology. This course covers the fossil record of vertebrate animals. Topics covered include the origin of vertebrates, phylogenetic relationships among modern vertebrates, introductory osteology and comparative anatomy of vertebrates, the advent of bone, the transition to land, the origin of flight in vertebrates, the warm-blooded vs. cold-blooded controversy in dinosaurs, the relationship between birds and dinosaurs, hominid evolution, and the origin of man. Readings from the current scientific literature are used. Prerequisite: EES 207.

272. Advanced Principles of Paleontology. A continuation of EES 207, but with an increased emphasis on broad-scale concepts and applications of paleontology. Topics covered include principles of biostratigraphy, biogeography, paleoclimatology, and evolutionary paleontology. Seminars focus on case studies that illustrate particular principles. Course builds on fundamental knowledge of invertebrate paleontol-

ogy.

274. Seminar in Paleoceanography. Credit—2 hours. Topics of discussion include the history of deep-water formation and surface circulation, geochronology, stratigraphy, and ocean chemistry and the results from deep-sea drilling in general. Prerequisite: permission of instructor.

275. Seminar on Extinction in Earth's History. Extinction is a hot-button topic these days. This course explores the various forms of extinction including background extinction, mass extinction, and pseudo-extinction. Discussions on how interpretation of extinction is affected by geological processes and fundamental understanding of what a "species" is. Part of the class focuses on the "big five" mass extinctions, but also discusses other problems related to extinction such as Lazarus taxa, "living fossils," and the Signor-Lipps effect. Readings and student-led discussions from the current scientific literature are used. Prerequisite: EES 207.

283. Sedimentary Basin Analysis. By determining how sedimentary basins develop and fill, we better understand the tectonic and eustatic controls on subsidence and surficial processes. Basin classification schemes, flexural and thermal subsidence, isostasy, sequence stratigraphy, and techniques used to characterize sedimentary basin evolution are discussed. Prerequisite: EES 203.

285. Structure and Tectonics of Mountain Belts. Orogeny and its relationship to plate tectonics. Structural style and tectonic history of mountain belts with special reference to the Appalachians and Cordilleras. Homework assignments involve drawings and interpreting cross-sections through mountain belts. Field trip to the Appalachians to look at typical structures of mountain belts. Prerequisite: EES 208 or equivalent. (Spring)

286. Seminar in Sedimentology and Tectonics. Interpreting the lithofacies and chemistry of sedimentary rocks to understand paleoenvironment; impact of tectonics on climate. Topics vary each semester. Classwork will involve readings, presentations, and discussions of classic and current literature. Prerequisite: EES 101; EES 203 recommended. (Spring)

288. Geometry and Mechanics of Thrust Faults. Geometry of thrust faults and thrust belts. Mechanics of thrust motion and thrust emplacement. Homework assignments and readings on current literature in thrust mechanics and geometry. (Spring)

298. Introduction to Research Methods. A basic introduction to research in the earth and environmental sciences is provided in one of the laboratories that comprise the depart-ment's Center for Analytical Geosciences.

299. Field Geology. This course covers the essential geologic and geophysical approaches to field stratigraphy, mapping, and structural interpretation. The coursework is based on observations made during a substantial field excursion (usually six weeks long). Additional credit may be earned by laboratory analysis of samples collected during the field excursion. Prerequisite: permission of instructor.

318W. Environmental Decisions. Analysis of decisions resulting in environmental change as seen from scientific perspective. The interaction of scientists with the public and with policymakers is also emphasized. A College writing course. (Spring)

319W. Energy Decisions. Investigation of the decision-making processes leading to the use of specific energy sources in developed countries, with special attention given to the United States and Germany. Review of energy sources in use today (hydrocarbons, nuclear) and potential alternatives (wind, solar); comparison of electoral systems; history of environmental movements and decision processes in the United States and Germany. Seminar course; evaluation based on oral presentations and papers. Fulfills Department of Earth and Environmental Sciences writing requirement. (Spring)

360. Environmental Geology in the Field and Laboratory. This course provides instruction in laboratory techniques used in the analysis of natural waters. The laboratory techniques are applied to the study of local environmental problems and include instruction in atomic absorption spectrophotometry; ion and gas chronatography, as well as standard "wet" chemical techniques. Prerequisites: CHM 103/104, MTH 161, EES 217. (Fall)

390. Supervised College Teaching.
(Fall and Spring)

391. Independent Study in Geology. (Fall and Spring)

392. Special Topics Seminar. (Fall and Spring)

393. Senior Thesis. An individual research course for seniors who have completed the basic program of undergraduate courses required for a major. (Fall and Spring)

394. Internship. Experience in an applied setting supervised on site. Approved and overseen by a University instructor. (Fall and Spring)

ECONOMICS

Mark Aguiar, Ph.D. (M.I.T.) *Professor of Economics*
Mark Bils, Ph.D. (M.I.T.) *Professor of*

Economics; Chair of the Department
John Duggan, Ph.D. (Caltech) *Professor of Political Science and Economics*
Stanley Engerman, Ph.D. (Johns Hopkins) *John Munro Professor of Economics and Professor of History*
Ronald Winthrop Jones, Ph.D. (M.I.T.) *Xerox Professor of International Economics*
Steven Landsburg, Ph.D. (Chicago) *Professor of Economics*
Charles E. Phelps, Ph.D. (Chicago) *Professor of Economics, of Political Science, and of Community and Preventive Medicine*
Alan Stockman, Ph.D. (Chicago) *Marie Curran Wilson and Joseph Chamberlain Wilson Professor of Economics*
William Thomson, Ph.D. (Stanford) *Professor of Economics*
Yongsung Chang, Ph.D. (Rochester) *Associate Professor of Economics*
Árpád Ábrahám, Ph.D. (Universitat Pompeu Fabra) *Assistant Professor of Economics*
Paulo Barelli, Ph.D. (Columbia) *Assistant Professor of Economics*
Gregorio Caetano, Ph.D. (California, Berkeley) *Assistant Professor of Economics*
Bin Chen, Ph.D. (Cornell) *Assistant Professor of Economics*
William Hawkins, Ph.D. (M.I.T.) *Assistant Professor of Economics*
Jay Hong, Ph.D. (University of Pennsylvania) *Assistant Professor of Economics*
Joshua Kinsler, Ph.D. (Duke) *Assistant Professor of Economics*
Romans Pancs, Ph.D. (Stanford) *Assistant Professor of Economics*
Ronni Pavan, Ph.D. (Chicago) *Assistant Professor of Economics*
Gábor Virág, Ph.D. (Princeton) *Assistant Professor of Economics*
Nese Yildiz, Ph.D. (Stanford) *Assistant Professor of Economics*
Michael Wolkoff, Ph.D. (Michigan) *Senior Lecturer in Economics; Deputy Chair of the Department*
Michael Rizzo, Ph.D. (Cornell) *Lecturer in Economics*
Lionel Wilfred McKenzie, Ph.D. (Princeton) *Wilson Professor Emeritus of Economics*
Walter Y. Oi, Ph.D. (Chicago) *Elmer B. Milliman Professor Emeritus of Economics*

Teaching assistants supervise recitation and homework sections of ECO 108, 207, 209, 230, and 231. Approximately one course per semester is taught by an advanced part-time graduate instructor.

The Department of Economics offers a program of study leading to the B.A. degree in economics, financial economics, and economics and business strategies, and at the graduate level, to the M.A. and Ph.D. degrees. The department also offers a minor in economics as well as six different economic clusters.

The undergraduate program emphasizes the understanding of modern tools of economic analysis and their application to contemporary policy issues. Those completing an appropriate program should be adequately prepared for graduate work in economics and other professional schools. A more detailed description of the program of the Department of Economics is available from the department office, and on the Web at www.econ.rochester.edu.

REQUIREMENTS FOR A CONCENTRATION IN ECONOMICS

(Effective for the class of 2007 and beyond. See our Web site at www.econ.rochester.edu for the most current version of all rules.)

- One year of calculus established by the successful completion of MTH 143, 162, 172, or equivalent.
- ECO 108 (must not be taken after any 200-level economics course; students may place out of ECO 108 and substitute a 200-level economics course).
- ECO 230 (Economic Statistics). Students may substitute STT 213 or MTH/STT 203 as alternatives.
- ECO 207, 209, 230, and 231 (all completed by end of junior year).
- Four additional economics courses (200 level or above, except 394; five if ECO 108 is not taken).
- A "C" average in the above economics courses.
- Two courses beyond the introductory level in an allied field, subject to approval by the faculty advisor.
- Completion of the upper-level writing requirement.

REQUIREMENTS FOR A CONCENTRATION IN FINANCIAL ECONOMICS

- One year of calculus
- ECO 108 (must not be taken after any 200-level economics course; students may place out of ECO 108 and substitute a 200-level economics course).
- ECO 230 (Economics Statistics). Students may substitute STT 213 or MTH/STT 203 as alternatives.
- ECO 207, 209, 230, and 231 (all completed by end of junior year).
- FIN 205.
- FIN 206.
- Three additional 200-level electives (one of which must be International Finance, Economics of Organizations, Econometrics of Financial Markets, Public Finance).
- Accounting 201.
- Accounting 221.
- MTH 210 (Introduction to Financial Mathematics). Must be taken prior to second finance course.
- Completion of the upper-level writing requirement.

REQUIREMENTS FOR A CONCENTRATION IN ECONOMICS AND BUSINESS STRATEGIES

- One year of calculus
- ECO 108 (must not be taken after any 200-level economics course; students may place out of ECO 108 and substitute a 200-level economics course).
- ECO 230 (Economics Statistics). Students may substitute STT 213 or MTH/STT 203 as alternatives.
- ECO 207, 209, 230, 231, and 251 (all completed by end of junior year).
- Specialized track of four advanced courses; choose Organizations and Markets (Path A) or Methods for Market Analysis (Path B)

Path A: Organizations and Markets

- ECO 288. Introduction to Game Theory
- ECO 274.Mathematical Tools in Economics
- ECO 217. Contracts, Organizations, and Markets
- OMG 231. Operations Management

or

- STR 421. Economics of Competitive Strategies (with instructor permission)

or

Path B: Methods for Market Analysis

- MKT 203. Principles of Marketing
- MKT 213. Marketing Projects and Cases

or

- MKT 414. Pricing Policies (with instructor permission)
- STT 221W. Sampling Design
- ECO 233. Applied Econometrics
- Three additional electives (choose from economics electives, 200-level or above Simon electives, or from two psychology courses: PSY 264 (Industial Organizational Psychology), PSY 364 (Achievement and Motivation), or new 200-level philosophy courses in business ethics)
- Completion of the upper-level writing requirement.

THE HONORS PROGRAM

Students seeking an enriched curriculum can pursue a concentration with honors. The Honors Program requires additional course-work in mathematics and economics, as well as enrollment in "honors" designated courses. Honors graduates also write a research paper in Senior Seminar. For specific details on the requirements for a concentration with honors, please visit our Web site at www.econ.rochester.edu.

CITATIONS OF ACHIEVEMENT

Students who concentrate in economics can also earn a citation of achievement. More information is available from the department office and on the Web at www.econ.
rochester.edu.

CLUSTERS IN ECONOMICS

Information is available at the department office as well as on the Web at www.rochester. edu/College/CCAS/clusters/.

REQUIREMENTS FOR A MINOR
IN ECONOMICS

- ECO 207
- ECO 209
- Three additional 200-level economics courses

UPPER-LEVEL WRITING REQUIREMENT
Students will meet the upper-level writing requirement by taking two upper-level writing courses within the Department of Economics. For most students, one of these courses will be econometrics. The second course can be chosen from a variety of electives, denoted by the postscript "W" in the course schedule.

SCHEDULING
ECO 108, 207, 209, 230, and 231 are offered in fall, spring, and summer. Elective courses are generally offered not more than once each year.

COURSES OF INSTRUCTION
Definitive course listings are published before each semester. Course listings can also be found on the Web under Student Life, Class Schedules. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

108. Principles of Economics. The fundamentals of microeconomic and macroeconomic theory, with applications; preparation for subsequent economics courses. (Fall and Spring)
118. Introduction to Political Economy. How do political institutions affect economic growth? How do economic conditions affect political decisions? This course is an introduction to the history of thought and current debates in political economy. The course reviews great texts in the history of political economy (by Adam Smith, Karl Marx, and others), presents an introduction to the modern tools used in the field, and shows their applications in the context of democratic and nondemocratic politics.
191Q. The Economic Way of Thinking. Small seminar open only to first-year students. No prior knowledge of economics is required. Students use ideas from economics to explore questions about human behavior, the role of government, the difference between right and wrong, and the nature of justice.
192Q. Population Growth: An Economic Perspective. Small seminar open only to first-year students. The decision to procreate and to allocate resources to future generations is surely an economic issue. This course examines the questions raised by biologists, demographers, and economists on the causes and consequences of population growth.
207. Intermediate Microeconomics. The economics of consumer choice and the demand for goods; producer choice, including the supply of goods and the demand for labor and other inputs; the effects of competition and monopoly power on prices and production. Prerequisite: ECO 108 or equivalent. (Fall and Spring)
207H. Honors Intermediate Micro-eco-nomics. This course shows how the choices of consumers and firms interact through markets to determine all the factors related to economic well being. In comparison to other sections of ECO 207, this section develops these choices more formally and mathematically. Prerequisites: Strong performance in ECO 108, completion of MTH 161, MTH 171, or completion of MTH 141 and 142. (Spring)
208. Topics in Microeconomic Theory. The major topics covered include general equilibrium analysis, problems of inter-temporal allocation of resources, the economics of uncertainty, and other topics as time permits. Prerequisites: calculus and ECO 207.
209. Intermediate Macroeconomics. National income accounting concepts; their changes and fluctuations as explained by theories of income determination. Prerequisite: ECO 207. (Fall and Spring)
209H. Honors Intermediate Macroeconomics. National income accounting concepts, their changes and fluctuations as explained by theories of income determination. In comparison to other sections of ECO 209, this section develops those concepts more formally and mathematically. Prerequisites: calculus and ECO 207. (Fall)
211. Money, Credit, and Banking. The institutions that generate the money supply. The influence of monetary and fiscal policy on economic stability and growth. Prerequisites: ECO 207 or with permission of the instructor.
217. Economics of Organizations. This course offers a unified treatment of the economics of contracts and organizations. Concepts of transaction costs, private information, and efficiency are used to study issues regarding coordination, incentives, organization, and mechanism design. Among others, answers are saught to the following questions: Do stock options or variable bonuses give better incentives for managers to work hard on the behalf of the shareholders? Should a medium size firm finance new investment by issuing equity or by borrowing? Should corporations expand vertically or horizontally? Prerequisite: ECO 207 and calculus. (Spring)
220. Fair Allocation. Examines issues of distribution and justice from an economics perspective. Topics that may be examined include fair taxation, fair political representation, apportioning the cost of NATO among the members, and dividing outer space. Prerequisites: calculus and ECO 108.
223. Economics of the Labor Market. Economics is used to understand the determination of wages, employment, workweeks;

the acquisition of skills; unions, discrimination, and unemployment. Prerequisite: ECO 207.

224. Economics of Sports and Entertainment. The markets for professional and amateur sports and entertainment are analyzed. Impacts of market organization and public policy on attendance, salaries, and profits are examined. Prerequisite: ECO 108.

226. Economic Development of the North Atlantic. This course is concerned with the economic development of Europe from the Middle Ages to date. Primary attention is given to Western Europe, but the im-pact of economic changes elsewhere is also discussed. Prerequisite: ECO 108. Same as HIS 210.

227. American Economic Growth. American economic history from the colonial period to the 1980s including discussions of growth in the colonial economy, slavery in the American south, the rise of "big business,'' causes of the depression in the 1930s, and the economic conditions of the period after World War II. Same as HIS 256. Prerequisite: ECO 108; ECO 207 is useful but not required.

228. Economics of Afro-American Slavery. The profitability and economic viability of the slave system and the effect of slavery on distribution of income as well as on the level and rate of growth of Southern per capita income are examined. Prerequisite: ECO 108.

230. Economic Statistics. Introduction to the probability and statistical theory underlying the estimation of parameters and testing of hypotheses in economics. Linear correlation and simple regression analysis. Students use computers to analyze economic data. The class consists of three hours of lecture and one hour of discussion. Prerequisite: students should have taken or be taking calculus. (Fall and Spring)

231. Econometrics. Regression analysis applied to time series and cross-section data, simultaneous equations; analysis of variance. Prerequisite: ECO 230, STT 213, or MTH 203. (Fall and Spring)

232. Econometrics of Financial Markets. Many results in the theory of finance rely on the fact that the time series representing financial data follows certain principles. In this course we analyze data in order to decide whether the standard models apply or not. Prerequisites: FIN 205 and ECO 231.

233. Applied Econometrics. The course is an introduction to the application of econometric methods in time-series modelling. It covers the basic tools of estimation, inference, and forecast of time-series models including ARMA, GARCH, and some nonstationary time-series models. The course emphasizes the intuitive understanding and practical application of these basic tools of econometric analysis. Prerequisite: ECO 230, 231 or permission of the instructor.

234. Regulation of Economic Activity. Analysis of the impact of government regulation in transportation, safety, and health on economic welfare and efficiency. Prerequisite: ECO 207.

235. The World Economy, Technology, Population, and Growth. This course examines the reasons for the growth in population and income as well as the reasons for uneven growth. Prerequisite: ECO 108.

236. Economics of Health. Analysis of factors that affect supply and demand in the market for medical care: risk, insurance, externalities, ethics, regulation. Prerequisite: ECO 207.

237. Economics of Education. Costs and returns to investment in education; public policy decisions about education; educational finance. Prerequisite: ECO 207. (Spring)

251. Industrial Organization—Theory and Evidence. An examination of the market structure, conduct, and performance of contemporary American industry. Assessment of industry concentration, market control, and associated pricing and innovative behavior is emphasized. Prerequisite: ECO 207.

252. Economics and Societies in Latin America and the Caribbean Since 1492. Provides historical explanation for the general problem of material poverty and the socio-political crises that characterize contemporary Latin America and the Caribbean. Same as AAS 252 and HIS 203.

253. Economics and Social Conditions of African Americans. Economic development of African Americans during the twentieth century. Prerequisite: ECO 207. Same as HIS 253 and AAS 253.

255. Africa's Sleeping Giant: Nigeria since the Islamic Revolution of 1804. This course is taught in the context of the world economic order, its evolution from the sixteenth century and the location of different parts of the world within it. The course focuses on the historical development of socioeconomic and political structures over time to explain why the giant of Africa has continued to slumber. Same as HIS 272 and AAS 260.

261. State and Local Public Finances. Examination of local taxation, provision of services, and intergovernmental fiscal relations. Prerequisite: ECO 207.

263. Public Finance and Fiscal Policy. Government tax and expenditure policies and their effect on resource allocation and income distribution. Prerequisite: ECO 207.

264. Urban Economics: Prospects for Metropolitan America. Examines conditions of urban America with emphasis on issues that are of particular importance to policy makers. Prerequisite: ECO 207. Same as AAS 264.

265. Law and Economics. Economic analysis of property rights, contracts, torts and civil procedure, crimes and criminal procedure, government regulation and controls, and alternative legal rules and systems.

Prerequisite: ECO 207.

268. Economics of Globalization. This course studies the economics of world integration and explores the arguments for and against opening an economy to international trade in goods and financial capital. The course specifically focuses on the implications of openness for welfare, growth, volatility, and inequality. Includes economic theory as well as several applications. Possible applications include the growth miracles of East Asia, India's recent transformation, emerging market crises of the 1990s, aid and development in Africa, and the impact of trade on wages in the United States. Prerequisite: ECO 207.

269. International Economics. Trade patterns and comparative advantage; commercial policy and the distribution of gains from trade; balance of payments problems. Prerequisite: ECO 207.

270. International Finance. The economics and institutions of flexible and fixed exchange rates, international money markets and Eurocurrencies, international debt and direct investment, and the balance of payments. Prerequisite: ECO 207 and 209. (Spring)

271. Economics of Human Behavior. This course applies economic principles to understand various aspects of human behavior that have usually been considered to be out-side the realm of economics. Prerequisites: ECO 207 and 231.

272. International Political Economy. Presents an overview of the international political economy and the role of nation-states within it. Same as PSC 274. (Spring)

273. Economic Growth and Development. This course begins with the empirical facts of economic growth and how growth economists have struggled to explain the evidence. Questions that this course addresses include How rich are rich countries? How poor are poor countries? Why are there these differences? Prerequisites: ECO 207 and calculus.

274. Mathematical Economics. Economic issues in consumer and producer theory treated in a formal, mathematical manner. Prerequisites: calculus and ECO 207.

282. Introduction to Positive Political Theory. An introduction to some recent developments in explaining and evaluating government behavior.

286. Political Economy of Property Rights. This course considers the political economy of property rights with special attention to applications to natural resources problems, organizational design, post-Communist transformations. Prerequisite: ECO 207. Same as PSC 286.

288. Introduction to Game Theory. An introduction to game theory with numerous applications to economic and political settings. Prerequisite: ECO 207. Same as PSC 288.

290. Political Economy of Markets and Hierarchies. This course examines markets, firms, states, and communities, asking how they work and who benefits (and who loses) from using them.

291. Political Economy of Economic Development. This course investigates both theoretical and empirical issues in economic growth. Examples are drawn from recent international experiences including those of the newly developed nations of the Far East and of formerly Communist block countries.

293. Politics and Economics of Post-Communist Transformation. This course focuses on structural adjustment policies, stabilization, privatization, liberalization, and the political economy of transition to a market. Same as PSC 292.

294. Economic Development in a Global Perspective. This course examines the development of, and connection between, the economies of Europe and Asia since 1350.
Same as HIS 294.

371. Evolution of the World Economic Order Since the Sixteenth Century. This course deals with the economic relations between the developed and less developed parts of the world since the sixteenth century. Attention is given to the impact of slavery and the slave trade upon Africa, Europe, and the Americas, and to the role of overseas trade in European and American development and its impact on the rest of the world. Same as HIS 357W/457 and AAS 371.

385. The Atlantic Slave Trade and -Africa, 1650–1850. The main thrust of the course shows the extent to which the Atlantic slave trade retarded the development of capitalism in Africa between 1650 and 1850, and so creating the conditions for the imposition of European colonial domination on the continent from the late nineteenth century. Same as AAS 375 and HIS 356W/456.

388. Federal Reserve Bank Workshop. Credit—2 hours. Workshop is designed to
prepare students for participation in the
Federal Reserve Bank competition by providing students with a better understanding of the Federal Reserve's role in developing and implementing monetary policy.

389. Senior Seminar. Supervised research on an economic problem or policy issue, culminating in papers that serve as a basis for seminars. Taken in senior year or with permission of instructor. (Spring)

390. Supervised Teaching of Economics. Responsibility for one recitation section and/or for holding office hours under the instructor's supervision. Departmental approval required.

391. Independent Study. Designed for advanced students seeking to do research beyond what is contained in the regular course offerings. Requires faculty supervisor in the economics department.

394. Internship. Not for concentration credit. Requires faculty supervisor in the economics department.

The following graduate courses are open to advanced undergraduates with permission of the instructor.

471. Modern Value Theory I. The foundation of modern microeconomic analysis, including consideration of consumer behavior,

the theory of the firm, equilibrium under alternative market structures, and welfare implications. (Fall)

472. Modern Value Theory II. Introduc-tion to general equilibrium analysis, including modern treatment of existence, stability, and comparative statics properties; elements of capital theory.

475. Macroeconomics I. Reviews the main empirical regularities that characterize economic growth and business fluctuations in market economies. Discusses various theoretical models of the business cycle as well as the macroeconomic impact of fiscal and monetary policy. (Fall)

476. Macroeconomics II. This course continues with the themes developed in 475; business cycles, economic growth, fiscal and monetary policies. More emphasis is placed on the tools required to do modern macroeconomics: dynamic programming, difference equations, Markov chains, etc. Computational techniques such as linear quadratic and discrete state-space dynamic programming, the Coleman algorithm, and parameterized expectations are taught. (No prior knowledge of these techniques is assumed.)

481. Mathematical Economics I. This course covers the use of optimization theory in economic analysis. The topics covered include finite-dimensional optimization (unconstrained optimization, Lagrange's Theorem, the Kuhn-Tucker Theorem), the role of convexity in optimization, parametric continuity of solutions to optimization problems, and finite and infinite horizon dynamic programming.

483. Introduction to Mathematical Statistics. Credit—2 hours. Elements of probability theory and statistics as employed in the econometrics sequence ECO 484–485. (Fall)

484. Introduction to Econometrics. Credit—2 hours. Estimation and hypothesis testing in the standard linear model; small and large sample properties; generalized methods of moments. Prerequisite: ECO 483 or departmental permission. (Fall)

485. Elements of Econometrics. Credit—3 hours. Extensions of the general linear model to handle serial correlation, hetero-skedasticity, simultaneity, maximum likelihood estimation, and testing. Diagnostic checking of estimated models. Problems in the analysis of individual unit data—qualitative dependent variables and sample self-selectivity. Prerequisites: ECO 483 and 484. (Spring)

ENGLISH

David Bleich, Ph.D. (New York University) *Professor of English and Professor in the College*
Morris Eaves, Ph.D. (Tulane) *Professor of English*
Kenneth Gross, Ph.D. (Yale) *Professor of English and Director of Undergraduate Studies*
Thomas G. Hahn, Ph.D. (California, Los Angeles) *Professor of English*
Sarah Higley, Ph.D. (California, Berkeley) *Professor of English*
Bette London, Ph.D. (California, Berkeley) *Professor of English*
James Longenbach, Ph.D. (Princeton) *Joseph H. Gilmore Professor of English*
Alan Lupack, Ph.D. (Pennsylvania) *Adjunct Professor of English and Curator of the Rossell Hope Robbins Library*
John Michael, Ph.D. (Johns Hopkins) *Professor of English and of Visual and Cultural Studies and Chair of the English Department*
Russell A. Peck, Ph.D. (Indiana) *Professor of English and John H. Deane Professor of Rhetoric and English Literature*
Joanna Scott, M.A. (Brown) *Roswell S. Burrows Professor of English*
George Grella, Ph.D. (Kansas) *Associate Professor of English and of Film and Media Studies*
Rosemary Kegl, Ph.D. (Cornell) *Associate Professor of English*
Jeffrey Tucker, Ph.D. (Princeton) *Associate Professor of English and Director of Frederick Douglass Institute for African and African-American Studies*
Jennifer Grotz, Ph.D. (Houston) *Assistant Professor of English*
Genevieve Guenther, Ph.D. (California, Berkeley) *Assistant Professor of English*
Stephanie Li, Ph.D. (Cornell) *Assistant Professor of English*
Katherine Mannheimer, Ph.D. (Yale)

Assistant Professor of English
James Memmott, Ph.D. (Minnesota)
Adjunct Assistant Professor of English
Jason Middleton, Ph.D. (Duke) *Assistant Professor of English*
Greta Niu, Ph.D. (Duke) *Assistant Professor of English*
Supritha Rajan, Ph.D. (North Carolina, Chapel Hill) *Assistant Professor of English*
Stephen Schottenfeld, M.F.A. (Iowa)
Assistant Professor of English
Nigel Maister, M.F.A. (Carnegie Mellon)
Senior Lecturer in English and Director of International Theatre Program
Gordon Rice, M.F.A. (California Institute of the Arts) *Senior Lecturer in English and Production Manager of International Theatre Program*
Curtis Smith, B.A. (SUNY, Geneseo) *Senior Lecturer in English*
Kenneth Johnson, B.A. (Seattle) *Lecturer in English and Director of Forensics*
Thomas Gavin, M.A. (Toledo) *Professor Emeritus of English*
Richard Gollin, Ph.D. (Minnesota) *Professor Emeritus of English and of Film and Media Studies*
Cyrus Hoy, Ph.D. (Virginia) *John B. Trevor Professor Emeritus of English*
Bruce Johnson, Ph.D. (Northwestern)
Professor Emeritus of English
James William Johnson, Ph.D. (Vanderbilt) *Professor Emeritus of English*
Jarold W. Ramsey, Ph.D. (Washington)
Professor Emeritus of English
Frank Shuffelton, Ph.D. (Stanford) *Professor Emeritus of English*

The English department's extensive and varied course offerings introduce students to the major texts, genres, and traditions of British and American literature as well as to other literatures in English. The courses invite students to think about literature in relationship to other arts and disciplines and to examine critically not only acknowledged masterpieces but new and emerging works and the practices of popular culture. Emphasizing the creation and performance of imaginative literature as well as the study of it, the department offers a rich array of courses in creative writing and theater; and it offers courses focused on literary media, from oral to electronic, including an extensive repertoire of film and media studies courses. It also offers courses in public speaking, debate, rhetoric, expository writing, and the study of language.

The major in English offers students four distinct paths for fulfilling their concentration: the standard English major, with an emphasis on literature; the English major with an emphasis on creative writing; the English major with an emphasis on language, media, and communication; and the English major with an emphasis on theater. English majors can apply to take part in the English Honors Program, where they participate in a special advanced seminar and write an extended honors thesis in their senior year; with the approval of the creative writing advisor, students can do creative writing projects for their honors thesis. The department also offers minors in English in literature, writing (creative writing or journalism), and theater.

GENERAL COURSE INFORMATION

Courses numbered 200–390 are customarily open to sophomores, juniors, seniors, and qualified first-year students. Students wishing to take any English course numbered 200 or higher should generally have satisfied the College's primary writing requirement or have taken at least one introductory course (100-level) in literature.

Several of the creative writing and journalism courses require permission of the instructor. Please see the department's course descriptions each semester for details.

REQUIREMENTS FOR A CONCENTRATION IN ENGLISH

A minimum of 10 courses is required. At least seven of the 10 must be English courses at the 200 or 300 level.
1. Concentrators must take two of the following courses, ideally by the end of the sophomore year:
ENG 112. Classical and Scriptural Backgrounds
ENG 113. British Literature I

ENG 114. British Literature II
ENG 115. American Literature

2. Concentrators may take one additional course at the 100-level, either a third survey course from the list above (ENG 112, 113, 114, 115) or one of the following "approaches to literary study" courses:

ENG 100. Great Books
ENG 101. Maximum English
ENG 111. Introduction to Shakespeare
ENG 116. Introduction to African-American Literature
ENG 117. Introduction to the Art of Film

3. Of the seven or eight courses at the 200 or 300 level:

a. Two must be in British or American literature before1800. Two must be in British or American literature after 1800.

b. One must be ENG 380, Research Seminar (from annual list provided by English department), ideally taken in the junior or senior year. ENG 396, Honors Seminar, counts as a Research Seminar (for students in the English Honors Program).

CONCENTRATION IN ENGLISH: CREATIVE WRITING

The Department of English offers a concentration in creative writing for students who want to explore the art of writing and refine their skills in critical reading. Students work intensively on their own imaginative writing (fiction, poetry, and play writing) in conjunction with the study of literature. Students wishing to pursue a Concentration in English: Creative Writing must apply to the creative writing advisor in the department and receive written approval.

A minimum of 10 courses is required.

1. Concentrators must take at least four courses in creative writing, as follows:

a. Two courses (8 credits) at the 100 level from among the following:

ENG 121. Creative Writing: Fiction
ENG 122. Creative Writing: Poetry
ENG 123. Playwriting
ENG 125. Speculative Fiction

b. One of the following courses:

ENG 275. Advanced Creative Writing: Fiction
ENG 276. Advanced Creative Writing: Poetry
ENG 277. Screen Writing

c. One of the following:

ENG 375. Seminar in Fiction Writing
ENG 376. Seminar in Poetry Writing

2. Concentrators must take two of the following courses:

ENG 112. Classical and Scriptural Backgrounds
ENG 113. British Literature I
ENG 114. British Literature II
ENG 115. American Literature

3. Concentrators must take four additional English courses at the 200 or 300 level, two of which must be in British or American literature before 1800 and two in British or American literature after 1800.

Students accepted into the honors program in English may write original fiction (a collection of stories or a novella), poetry, or a play to fulfill the requirements for the honors essay. Students choosing this option must have the approval of the creative writing advisor in the English department.

CONCENTRATION IN ENGLISH: LANGUAGE, MEDIA, AND COMMUNICATION

The Concentration in Language, Media, and Communication is designed to serve students who want to explore the department's multifaceted array of courses related to the forms of communication. Such courses—in editing, rhetoric, the history of the media of arts and communication, journalism, professional writing, public speaking, debate, etc.—may be of special interest to students who are contemplating careers in such areas as law, nonfiction writing, publishing, print journalism, or electronic journalism. The concentration, however, does not present a narrowly preprofessional curriculum; rather, it is designed to reflect the way English has come to be understood as encompassing a full array of practices from oral to electronic and to highlight the way English, in its objects of study, addresses the history, theory, and analysis of media.

While the requirements below offer a general template for the concentration, majors should devise a specific course of study in

close consultation with the language, media, and communication advisor, who must approve the final course of study.

A minimum of 10 courses is required, at least six of which must be at the 200 or 300 level.
1. Concentrators must take two literature courses, at least one of which must be at the 200 or 300 level.
2. Concentrators must take at least six courses from the following list, at least three of which must be in a single subgroup; this list is not comprehensive, so students should consult with the language, media and comunication advisor for complete and updated information about applicable courses.

JOURNALISM AND NONFICTION WRITING

ENG 126. Creative Nonfiction
ENG 130. Seminar in Writing (topical)
ENG 131. Reporting and Writing the News
ENG 132. Feature Writing
ENG 133. Editing Practicum
ENG 138. Journalism Case Studies
ENG 281. Literary Journalism

MEDIA

ENG 117. Introduction to the Art of Film
ENG 118. Introduction to Media Studies
ENG 255. Silent Cinema

or

ENG 256. Sound Cinema (can be taken more than once with different topics)
ENG 263. Media Studies (can be taken more than once with different topics)
ENG 267. Topics in Media Studies
ENG 283. Media ABC

RHETORIC AND LANGUAGE

ENG 134. Public Speaking
ENG 135. Debate
ENG 136. Advanced Debate
ENG 137. Freedom of Expression
ENG 200. History of the English Language
ENG 249. Gender, Writing, and Representation
ENG 284. Orality, Language, and Literacy
ENG 285. Advanced Writing and Peer Tutoring
ENG 286. Presidential Rhetoric

With permission of the language, media, and communication advisor, students may count up to two preapproved courses taught in other departments (e.g., Art and Art History, History) toward the three courses that may be distributed across any of the groups above. Concentrators may also substitute an additional internship (ENG 394) for one of these three courses.
3. Concentrators must take either an approved ENG 394, Internship in English, or ENG 380, Research Seminar (from an annual list provided by the English Department). ENG 396, Honors Seminar, counts as a Research Seminar (for students in the English Honors Program).
4. Concentrators must take one additional 200- or 300-level English course, from items 1, 2, or 3 above.

CONCENTRATION IN ENGLISH: THEATER

The English department offers a special major intended to provide institutional support and recognition to students who want to invest a significant part of their undergraduate careers in theater and theater-related courses, and to furnish such students with credentials reflecting their work in theater.

A minimum of 12 courses (amounting to at least 48 credit hours) in English and theater courses is required.
1. Students must take two of the following surveys:
ENG 112. Classical and Scriptural Backgrounds
ENG 113. British Literature I
ENG 114. British Literature II
ENG 115. American Literature
2. Of the remaining courses in literature and theater, 16 hours of credit must be in theater production (either onstage or backstage).

Each student must work on at least four productions, serving in stage management or as an assistant director for at least one, choosing from the following (spring semester course numbers in parentheses):
ENG 290 (291). Plays in Production
ENG 292 (293)/294 (295). Plays in Performance
ENG 296 (297). Stage Management

3. Theater concentrators also are required to take 8 hours of credit in theater method and/or performance courses, choosing from the following (spring course numbers in parentheses):
ENG 123. Playwriting—2 credits
ENG 170 (171)/270 (271). Technical (and Advanced Technical) Theater
ENG 172. Intro to Stage Lighting and Sound
ENG 174 (175). Acting Techniques
ENG 176 (177). Voice and Movement for the Actor
ENG 180. Directing
ENG 252. Theater in England
ENG 360. Special Projects: Theater

Finally, theater concentrators must take 16 hours of credit in literary study courses in British or American literature, two of which must be in literature before 1800, and two courses in dramatic literature.

Additionally, students taking an Internship in Theater (ENG 398), undertaking an Independent Study (ENG 391) whose subject is theater or dramatic research, or enrolled in a standard Research Seminar (ENG 380) or Honors Seminar (ENG 396) with a dramatic literature/theatrical focus might also have those classes count towards the theater concentration. Similarly, Study Abroad options in London and Bath (if allied to dramatic or theatrical work) might count towards this concentration. Other courses in the English department relating to drama and/or theater may, from time to time, be valid additions to this list. See the director of undergraduate studies for details.

In cases where some courses are unavailable, students should consult with the director of undergraduate studies for possible substitutions.

For further information, contact the director of undergraduate studies and/or the artistic director of the Theatre Program.

REQUIREMENTS FOR A MINOR IN ENGLISH

The Department of English offers minors in English literature, in writing (with two separate tracks: Creative Writing or Journalism), and in theater. The minors in writing and theater emphasize the practical aspects of the discipline and are open to English majors as well as nonmajors. All four minors stipulate a minimum of six courses, five of which must be taken in residence. No more than two courses in one's major may be counted toward the minor. Students wishing to minor in English should contact the director of undergraduate studies in English.

THE MINOR IN ENGLISH LITERATURE

1. ENG 113. British Literature I
2. ENG 114. British Literature II

or

ENG 115. American Literature

3. Four additional courses in British or American literature, three of which must be at the 200 or 300 level

THE MINOR IN WRITING (CREATIVE WRITING, JOURNALISM)

Students minoring in writing choose one of these tracks:

Creative Writing

Six courses are required:
1. Two creative writing courses (8 credits):
ENG 120. Introduction to Creative Writing
ENG 121. Creative Writing: Fiction
ENG 122. Creative Writing: Poetry
ENG 123. Playwriting. Credit—2 hours
ENG 125. Speculative Fiction

2. At least one advanced creative writing course:
ENG 275. Advanced Creative Writing: Fiction
ENG 276. Advanced Creative Writing: Poetry
ENG 277. Screen Writing
ENG 375. Seminar in Fiction Writing
ENG 376. Seminar in Poetry Writing
3. Additional courses, if needed, to be chosen from the department's offerings in writing, or from its 200-level and 300-level offerings in
literature.

Journalism
Six courses are required:
1. ENG 131. Reporting and Writing the News
2. ENG 132. Feature Writing
3. At least one of the following courses:
ENG 120. Introduction to Creative Writing
ENG 121. Creative Writing: Fiction
ENG 122. Creative Writing: Poetry
ENG 125. Speculative Fiction
ENG 130. Seminar in Writing
4. At least two of the following courses:
ENG 133. Editing Practicum
ENG 392. Research Project in Journalism
ENG 394. Internship
5. Appropriate additional courses, if needed, to be chosen from the 200- and 300-level courses in literature or criticism.

THE MINOR IN THEATER
The minor in theater consists of a minimum
of 24 credits taken from the following three categories. No more than two courses included in one's major may be counted toward the minor.
1. A student must work on at least two, but no more than three, productions, acquiring at least 8 credits in production and performance courses, either onstage or backstage (spring semester course numbers in parentheses):
ENG 290 (291). Plays in Production
ENG 292 (293)/294(295). Plays in
Performance
ENG 296 (297). Stage Management
2. Theater method and performance courses; 8 credits in all (spring semester course numbers in parentheses):
ENG 123. Playwriting—2 credits
ENG 170 (171)/270 (271). Technical
(and Advanced Technical) Theater
ENG 172. Intro to Stage Lighting and Sound
ENG 174 (175). Acting Techniques
ENG 176 (177). Voice and Movement for the Actor—2 credits
ENG 180. Directing
ENG 252. Theater in England
ENG 360. Special Projects: Theater
3. Dramatic literature—8 credits (at least two courses):
ENG 111. Introduction to Shakespeare
ENG 203. Medieval Drama
ENG 208. Renaissance Drama, Elizabethan and Jacobean Drama
ENG 209. Problems in Shakespeare
ENG 210. Shakespeare
ENG 214. Restoration and Eighteenth-Century Drama
ENG 228. African-American Drama
ENG 235. Modern Drama

ENG 243. Major Author—a playwright

Additionally, students taking an Internship in Theater (ENG 398), Independent Study (ENG 391) whose subject is theater or dramatic research, or enrolled in a standard Research Seminar (ENG 380) or Honors Seminar (ENG 396) with a dramatic literature/theatrical focus might also have those classes count towards a minor in theater. Similarly, Study Abroad options in London and Bath (if allied to dramatic or theatrical work) might count towards a minor. Other courses in the English department relating to drama and/or theater may, from time to time, be valid additions to this list, also. See the Director of Undergraduate Studies for details.

In cases where some courses are unavailable, students should consult with the director of undergraduate studies for possible substitutions.

For further information, contact the director of undergraduate studies and/or the artistic director of the Theatre Program.

UPPER-LEVEL WRITING REQUIREMENT

Because most upper-level English courses are writing intensive, providing extensive attention to writing and revision, concentrators fulfill the upper-level writing requirement as part of the regular requirements for the major. For students doing the standard English concentration, this includes a 300-level research seminar, which serves as a major component of the upper-level writing requirement. For concentrators doing English with an emphasis on Creative Writing and Writing, Media, and Communication, the concentration necessarily includes upper-level courses with writing as their primary subject and medium. Concentrators in English with an emphasis on Theater fulfill the upper-level writing requirement as part of their regular requirement of sixteen hours of credit in literary study courses.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

INTRODUCTORY AND GATEWAY COURSES

100. Great Books. Provides a close reading of a selection of literary masterpieces. Readings vary from year to year.
101. Maximum English. A gateway course introducing students to basic concepts and skills, and to the particular features of the English department and its faculty.
111. Introduction to Shakespeare. A selection of his major plays.
112. Classical and Scriptural Backgrounds. The great tradition, from Homer, Greek drama, Plato, and Virgil to the Bible and Dante. Same as REL 140.
113. British Literature I. An introductory study of early British literature, its forms and themes, and the development of our literary tradition.
114. British Literature II. Major themes and central ideas in British literature of the eighteenth, nineteenth, and twentieth centuries.
115. American Literature. Significant achievements by American writers of poetry, fiction, and other prose in the nineteenth and twentieth centuries.
116. Introduction to African-American Literature. A survey of African-American literature, fiction, and nonfiction, beginning with the late eighteenth century.
117. Introduction to the Art of Film. The primary visual, aural, and narrative structures and conventions by which motion pictures create and comment upon significant human experience. Same as AH 112 and FMS 132.

CREATIVE WRITING COURSES

120. Creative Writing. Introductory workshop exploring multiple genres.
121. Creative Writing: Fiction. Short story workshop.
122. Creative Writing: Poetry. Poetry writing workshop.
123. Playwriting. Credit—2 hours. A course devoted to the understanding and execution of dramatic writing that is unique to the theater.
125. Speculative Fiction. A creative writing course dedicated to commercial and/or literary fiction with an emphasis on science fiction, fantasy, and magic realism.
126. Creative Nonfiction.
275. Advanced Creative Writing:
Fiction. Seminar in fiction writing. Emphasis on individual development of style.
276. Advanced Creative Writing: Poetry. Seminar in poetry writing. Emphasis on individual development of style.
277. Screen Writing. The primary text for this course is students' own scripts in progress. The course also examines various pro-

fessional scripts, both film and television.
375. Seminar in Writing: Fiction.
376. Seminar in Writing: Poetry.
377. Writing in Other Genres.

WRITING, JOURNALISM, AND COMMUNICATION
130. Seminar in Writing. Students read and write essays on a range of topics in the arts and sciences. Topics vary from year to year. The course emphasizes mastery of voice, argument, and rhetorical strategy.
131. Reporting and Writing the News. A laboratory course (requiring typing) on the fundamentals of gathering, assessing, and writing news.
132. Feature Writing. A workshop administered by the Department of English and the Gannett Newspapers.
133. Editing Practicum. Practicum seminar on editing a newspaper, with special attention to the *Campus Times*.
134. Public Speaking. Practice in effective small-group communication and the presentation of expository and persuasive speeches.
135. Debate. Critical thinking and reasoned decision making through argumentation.
136. Advanced Debate. Debate theory and practice through varsity-level intercollegiate competition and research.
137. Freedom of Expression. This course explores the controversies surrounding censorship, free speech, and hermeneutics.
138. Journalism Case Studies.
281. Literary Journalism.
283. Media ABC. Provides a historical and critical introduction to the idea of medium and media, including books, paint, electronic files, music, photography, etc.
284. Orality, Language, and Literacy.
285. Advanced Writing and Peer Tutoring. This course prepares selected undergraduates for work as writing advisors.
286. Presidential Rhetoric.

QUEST COURSES
19X. Quest Courses. Courses that introduce students to the study of literature and the practice of research. Topics vary for each section.

MAJOR AUTHORS AND HISTORICAL PERIODS
Pre-1800
200. History of the English Language. The development of the English language from the Anglo Saxon period on up, focusing on texts from representative periods.
201. Old English Literature. Literature written in England before the Norman Conquest. Latin works are read in translation; vernacular works, in the original.
202. Middle English Literature. Poetry, prose, and drama of the thirteenth, fourteenth, and fifteenth centuries, exclusive of Chaucer. Readings in Middle English.
203. Medieval Drama. English drama from its beginnings until 1580, including material from the mystery cycles, moralities, and early Tudor drama.
204. Chaucer. The principal works of Chaucer, in their historical and intellectual context. Readings in Middle English. Same as REL 208.
206. Studies in Medieval Literature.
207. English Renaissance Literature. Sixteenth-century literature from Sir Thomas More to Spenser, with some attention to the continental background.
208. Elizabethan and Jacobean Drama. English Renaissance drama through 1642, exclusive of Shakespeare.
209. Studies in Shakespeare.
210. Shakespeare. Readings of a selection of Shakespeare's plays.
211. Milton. The works of Milton in their historical and intellectual context.
213. Studies in Renaissance Literature.
214. Eighteenth-Century Literature.
215. Early British Novel. The novel from its beginnings to the early nineteenth century, emphasizing such novelists as Defoe, Fielding, Richardson, and Austen.
217. Studies in Eighteenth-Century Literature.
218. Early American Literature. From 1630 to 1830, including Puritan nonfiction and poetry; exploration narrative; and fiction, drama, and poetry of the Revolutionary and early national eras.

Post-1800

220. Romantic Literature. Major writers, other than novelists, of the early nineteenth century, with particular emphasis on poets from Blake through Keats.

221. Victorian Literature. The major intellectual, cultural, and artistic developments of the Victorian period (1830–1900), in prose, drama, verse, and related arts.

222. Nineteenth-Century British Novel. Emphasizing such novelists as Dickens, Thackeray, Eliot, and Hardy.

223. Studies in Nineteenth-Century Literature.

225. American Romantics. From 1830 to 1865, including Emerson and the transcendental movement, abolitionist writing and slave narrative, representative fiction, and poetry by Poe, Whitman, Melville, Stowe, and others.

226. American Realists. From 1886 to 1912, including poetry by Dickinson and Frost; realist and naturalist fiction by Twain, Wharton, James, Dreiser; representative nonfiction and philosophy.

227. American Moderns. From 1913 to 1941, including Eliot, Stevens, Cather, Faulkner, Hemingway, Fitzgerald, O'Neill, W. C. Williams, and others.

228. African-American Drama.

230. Studies in American Literature.

231. Twentieth-Century British Novel. The novel from 1900 to the present, emphasizing such novelists as Conrad, Joyce, Woolf, and Lawrence.

232. Modern Literature.

233. Modern Poetry. An introduction to representative twentieth-century poetry.

234. Modern Fiction.

235. Modern Drama. Great modern dramas from Ibsen to Ionesco as reflectors of the main currents in modern thought and feeling.

236. Contemporary Fiction. Examines novels and short fiction by contemporary English and American writers.

237. Contemporary Poetry. Poetry in English from around 1945 to the present, emphasizing latter-day transformations.

238. Studies in Modern and Contemporary Literature.

LITERARY MODES AND SPECIAL TOPICS

240. Literary Criticism and Theory.

241. Lyric Poetry.

242. Topics in Literature.

243. Studies in a Major Author.

244. Studies in a Literary Tradition.

245. Studies in a Literary Mode.

246. Detective Fiction. Examines some of the major authors and books of detective fiction, both British and American, concentrating on the twentieth century.

247. Science Fiction. Examines a range of science fiction texts and issues, including works by Mary Shelley, H. G. Wells, Isaac Asimov, Robert Heinlein, Samuel R. Delany, and more.

248. Studies in Women's Literature.

249. Gender, Writing, and Representation.

250. Literature and Ethnicity.

251. Studies in Popular Literature.

252. Theater in England.

253. The Literature of the Bible.

254. Arthurian Literature.

FILM AND MEDIA STUDIES

117. Introduction to the Art of Film. Same as FMS 132.

118. Introduction to Media Studies. The cultural, aeshetic, and economic history of visual media. Same as FMS 131.

255. Introduction to Film History: Silent Cinema. Same as FMS 233.

256. Introduction to Film History: Sound Cinema. Same as FMS 234.

258. Film Analysis.

259. Popular Film Genres. An intensive study of selected types of popular films in their larger cultural context. Same as FMS 251.

260. Film History. Same as FMS 254.

261. Film Theory. An introduction to the history, the theory, and especially the practice of criticism. Same as FMS 255.

262. Studies in a National Cinema. Films from a particular national cinema—British, Japanese, German, French, Italian, and others from various periods. Same as FMS 256.

263. Media Studies. This course addresses the history and theory of a range of communications media and visual technologies in science, industry, and popular culture. Same as FMS 257.
264. Studies in a Director. A course in the works and career of an outstanding and identifiable film director: Hitchcock, Warhol, Huston, Bunuel, Renoir, etc. Same as FMS 253.
265. Issues in Film. The course takes up particular concepts, ideas, and ideology in film, often spanning periods, nations, and genres. Same as FMS 252.
266. Issues in Film Theory. Same as FMS 244.
267. Topics in Media Studies. Same as FMS 259.
268. Museum Studies. Same as FMS 254.
283. Media ABC. Provides a historical and critical introduction to the idea of medium and media, including books, paint, electronic files, music, photography, etc. Same as FMS 249.

THEATER COURSES
123. Playwriting. Credit—2 hours. A course devoted to the understanding and execution of dramatic writing that is unique to the theater.
170/171. Technical Theater. An introductory course to the theories, methods, and practice of set construction, power tools, rigging, stage lighting, drafting, sound, and scene painting. Lab participation in theater program productions required.
270/271. Advanced Technical Theater.
172. Intro to Stage Lighting and Design. The course undertakes to introduce students to the various elements of theater design. Lighting techniques, sound design, and set design are all covered from time to time.
174/175. Acting Techniques. Training in the techniques by which individual actors set forth the characters recorded in dramatic texts.
176/177. Voice and Movement for the Actor. This is an introductory course on voice and movement for the actor.
180. Directing. Training in the methods by which actor and director embody the dramatic text; emphasis on studio practice. Limited to one or two students. Prerequisite: Permission of instructor.
182. The Actor and the Text.
290/291. Plays in Production. Set building, prop and costume development, and publicity for current production.
292/293/294/295. Plays in Performance. For actors and stage managers working on the current production.
296/297. Stage Management.
298. Acting Lab I. Credit—2 hours.
Mandatory acting lab for students in ENG 291.
299. Acting Lab II. Credit—2 hours.
Mandatory acting lab for students in ENG 293.

ADDITIONAL UPPER-LEVEL COURSES
370. Special Projects: Theater.
380–389. Research Seminars. Open to junior and senior English majors. Others may be admitted by permission of instructor.
391. Independent Study.
392. Research Project in Journalism.
394. Internships in English.
396. Honors Seminar. Limited to students completing the English honors program.
398. Theater Internship. Limited to students completing the English honors program.

FILM AND MEDIA STUDIES

PROGRAM FACULTY
Douglas Crimp, Ph.D. (CUNY) *Fanny Knapp Allen Professor of Art History and Professor of Visual and Cultural Studies*
Morris Eaves, Ph.D. (Tulane) *Professor of English*
Claudia Schaefer, Ph.D. (Washington, St. Louis) *Rush Rhees Professor and Professor of Spanish*
Sharon Willis, Ph.D. (Cornell) *Professor of Art History and of Visual and Cultural Studies; Director of the Program*
Joanne Bernardi, Ph.D. (Columbia) *Associate Professor of Japanese*
Elizabeth Cohen, M.F.A. (Rhode Island School of Design) *Associate Professor of Art*

George Grella, Ph.D. (Kansas) *Associate Professor of English and of Film and Media Studies*
Ewa Hauser, Ph.D. (Johns Hopkins) *Adjunct Associate Professor of Political Science*
Sarah Higley, Ph.D. (California, Berkeley) *Associate Professor of English*
Rheinhild Steingrover, Ph.D. (SUNY, Buffalo) *Associate Professor of German (Humanities, Eastman School of Music)*
Allen Topolski, M.F.A. (Pennsylvania State) *Associate Professor of Art*
Jason Middleton, Ph.D. (Duke) *Assistant Professor of English*
Greta Niu, Ph.D. (Duke) *Assistant Professor of English*
Richard M. Gollin, Ph.D. (Minnesota) *Professor Emeritus of English and of Film and Media Studies*

FILM AND MEDIA STUDIES

The Film and Media Studies Program offers an interdepartmental concentration leading to a bachelor's degree. A minor in film and media studies is also available. The film and media studies concentration offers students an opportunity to explore motion pictures, television, and the electronic arts as art forms and cultural phenomena. It consists of specific courses offered by participating departments, and it provides the opportunity for screening and analysis of centrally important works in the history of cinema and media from the core collection in the Film and Media Studies Center. Twenty or more film courses are offered annually by various departments; a list is made available each semester in time for preregistration.

The program offers a variety of clusters in film and media studies.

The Film and Media Studies Program also enjoys a close relationship with George Eastman House. All University students have free access to the museum and library on presentation of student identification. Important film screenings and special events are offered several nights a week at the Dryden and Curtis Theatres. The archival resources of the museum are also available for coursework and for special projects. In 2004, the University of Rochester and George Eastman House initiated a joint M.A. program. Students in the L. Jeffrey Selznick School of Film Preservation at the Eastman House have the option of enrolling in a two-year graduate program leading to a Master of Arts degree through the Department of English. For more information, contact the Film and Media Studies director or the graduate director of the English department.

REQUIREMENTS FOR A CONCENTRATION IN FILM AND MEDIA STUDIES

There are many career opportunities open to students of film and the media arts. Students go on to film or television school, pursuing graduate work in producing, directing, editing, cinematography, screenwriting, acting, and other creative aspects of media. Others choose to pursue the graduate study of media history, theory, and criticism in master's or doctoral programs. Media law and business also present exciting opportunities for postgraduate study. A major in film and media studies can also lead to exciting careers in print and media journalism, arts and museum management, film preservation and curating, library science, and multimedia production.

The concentration consists of 12 courses organized in the following categories. Students are admitted to the concentration on recommendation of the major advisor. The major includes a writing requirement, which is satisfied by successful completion of two intensive upper-level writing cour-ses. Each semester the program designates several such courses.

- One of two core courses
  a. FMS 131. Introduction to Media Studies
  or
  b. FMS 132. Introduction to Film Studies (Introduction to the Art of Film)
- One course in film/media history
- One course in international or transnational film/media
- One course in film/media theory
- Two courses in film/media analysis and criticism
- One course in media production
- Five elective film/media studies courses (two of which must be at the 200 or 300 level)

REQUIREMENTS FOR A CONCENTRATION IN MEDIA PRODUCTION

Students interested in media production are encouraged to creatively seek out courses that deepen their background in the arts—especially in studio art, theater, and creative writing—and to integrate them into their program of study. Concentrators in film and media studies may also elect to follow a special con-centration in media production as an alternative to the standard program of

study. The goal of the special concentration is to prepare students with the basic, creative background and the practical experience they need either to pursue the postgraduate study of film and television production or multimedia authoring, or to begin careers in these industries. The special concentration in media production comprises 12 courses, organized in the following manner:

- One of two core courses
  a. FMS 131. Introduction to Media Studies

  or

  b. FMS 132. Introduction to Film Studies
- One course in film/media history
- One course in international or transnational film/media
- One course in media theory
- One course in media history

and

- One course in media analysis and criticism
- One upper-level course (200 level or above in a nonproduction area)
- Five courses in production-related areas.
  The five courses in production-related areas may include work in creative writing, theater, photography, and the digital arts as well as media production.

Double-majoring in film and media studies and another field is also encouraged though not more than two courses may be proposed in common for the two majors.

Film and media studies concentrators may, if they wish, include in their senior year an independent reading or research course, FMS 391, or an independent project that calls upon the knowledge and discrimination acquired while completing these requirements.

FMS 394, film internships at television stations and local industries, as well as abroad, are open to film students under the sponsorship of the Film and Media Studies Program. The director can also recommend many other study abroad programs for a semester or a full year. Contact the director for more information. For information about internships abroad, contact the Center for Study Abroad.

REQUIREMENTS FOR A MINOR IN FILM AND MEDIA STUDIES

A minor concentration in film and media studies requires six courses as outlined below.

- FMS 132. Introduction to the Art of Film

  or

  FMS 131. Introduction to Media Studies
- One course in film/media history
- One course in either film/media theory or analysis and criticism
- Three additional film/media studies courses chosen in consultation with the faculty advisor. These courses may include three production-related courses thus comprising in effect a minor concentration in media production.

UPPER-LEVEL WRITING REQUIREMENT

Film and media majors will take two designated upper-level writing emphasis courses in the major. Please contact the Program Office for a list of designated courses.

COURSES OF INSTRUCTION

Course listings are published before each semester. For course descriptions see departmental listings. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

ART AND ART HISTORY

213. Race and Gender in Popular Film. Same as AH 213.
270. The Films of Jean-Luc Godard. Same as AH 211.
292. History of French Cinema.

ENGLISH

131. Introduction to Media Studies. Same as ENG 117.
132. Introduction to the Art of Film. Same as ENG 117.
247. Film History: Early Cinema.
Same as ENG 255.
248. Film History: 1929–1959.

Same as ENG 256.
249. Film History: 1959–Present.
Same as ENG 256.
232–240. Popular Film Genres.
Same as ENG 259.
210–220. Issues in Film.
Same as ENG 265.
264–274. Studies in a Director.
Same as ENG 264.
250–253. Studies in Film History.
Same as ENG 260.
244. Film Theory. Same as ENG 261.
278–299. Studies in a National Cinema. Same as ENG 262.
224–228. Media Studies.
Same as ENG 263.

IN FILM AND MEDIA STUDIES
161. Introductory Video and Sound. Same as SA 161.
162. Concepts: Introduction to Video and Sound. Same as SA 162.
390. Supervised Teaching.
391. Independent Study.
392. Practicum.
393. Senior Project.
394. Internship.

MODERN LANGUAGES AND CULTURES
229. Power of Popular Culture.
Same as CLT 101Z.
288. New German Cinema.
Same as GER 288.
289. Avant Garde Film. Same as GER 290.
290. Nazi Culture. Same as GER 287.
243. Film as Object. Same as JPN 207.
271. Buñuel and Company.
Same as SP 285.
278. Studies in a National Cinema: Latin America-Latin American Film.
Same as SP 287.
293. French Cinema: the New Wave. Same as FR 280.
298. Japanese Animation (Anime).
Same as JPN 292.
297. History of Japanese Film.
Same as JPN 283.
299. Monsters, Mobsters, and Swords. Same a JPN 284.
298. Japanese Cinema: The New Wave. Same as JPN 286.
284. Russia Goes to the Movies.
Same as RUS 267.
281. Spanish Film. Same as SP 288.
298. Atomic Creatures: Godzilla.
Same as JPN 214.

POLITICAL SCIENCE
256L. Political Films: Cold War.
Same as PSC 255.

STUDIO ART
205. Introductory Digital Art.
Same as SA 151.

256. Advanced Digital Art.
Same as SA 252A.
257. Advanced Video and Sound Art. Same as SA 262A.

HEALTH AND SOCIETY

***NOTE:* A significant revision of this major has been approved by the College. Several additional majors related to public health have also been approved and are pending approval by the New York State Department of Education. Information will be available on the College's Web site.**

Designed as a part of a liberal education, health and society is a multidisciplinary program of study consisting of courses from several departments leading to a B.A. degree. The program is administered by the College Center for Academic Support (which is located in 312 Lattimore Hall) and is supervised by the Health and Society Committee.

COMMITTEE ON HEALTH AND SOCIETY

Theodore M. Brown, Ph.D. (Princeton)
Professor of History, of Community and -Preventive Medicine, and of Medical Humanities
Anthony T. Carter, Ph.D. (Rochester)
Profes-sor of Anthropology
Bruce Jacobs, Ph.D. (Harvard) *Professor of Political Science*
Richard Dees, Ph.D. (Michigan) *Associate Professor of Philosophy, of Neurobiology, of Pediatrics, and of Medical Humanities*
Nancy Reynolds, M.S.P.H. (Massachusetts) *Health Educator*

Health and society is a multidisciplinary major intended for students considering careers in health care administration, health policy and planning, or the social services. Health and society majors planning careers in medicine should consult with a health professions advisor about premedical requirements.

The bachelor's degree with honors is awarded according to three criteria: (1) "B+" or better performance in the following honors courses taken for the health and society major: HLS 116 (Introduction to Community Medicine), HLS 201 (Research in the Health Sciences), and HLS 301 (Senior Seminar in Health and Society); (2) completion of a senior thesis; and (3) an oral defense of the thesis. Detailed information about the requirements is available in the College Center for Academic Support in 312 Lattimore Hall.

The bachelor's degree with distinction is awarded to students with a sufficiently high grade-point average in the major: 3.25 for distinction, 3.50 for high distinction, and 3.75 for highest distinction.

It is possible for students to earn the degree with both distinction and honors.

REQUIREMENTS FOR A MAJOR IN HEALTH AND SOCIETY

A total of 12 courses, distributed as follows:

Required Courses

- HLS 116. Introduction to Community Medicine
- STT 211. Applied Statistics for the Social Sciences I
- HLS 201. Research in the Health Sciences
- HLS 301. Senior Seminar in Health and Society

Health and Society Core Courses
(four from the following list)
- ANT 216. Medical Anthropology
- ECO 236. Health Policy
- HIS 208. Health, Medicine, and Social Reform
- HIS 209. Changing Concepts of Disease
- HIS 305W. American Health Policy and Politics
- PHL 225. Ethical Decisions in Medicine
- PSC 245. Aging and Public Policy
- PSY 283. Behavioral Medicine
- SOC 262. Medical Sociology
- CAS 394. London Health Sciences Internship

Elective Courses
Four from an extensive list available in the Center office.

After preliminary discussion with a staff member in the College Center for Academic Support, intended health and society majors should work with an advisor chosen from among the members of the Committee in developing their proposed course of study. Depending upon the student's special interests and future plans, a proposal might concentrate, for example, on the conceptual foundation of modern medicine; the politics, economics, and management of health care; biomedical ethics; or specific problems such as the elderly in modern society. In order to retain as far as possible the multidisciplinary character of the health and society major, students are urged to select courses from several departments. A program that includes four or more courses from a single department is not likely to be approved.

Please note: only two independent study/internship courses may be counted toward the health and society major. Students wishing to enroll in additional semesters of independent study or internship are free to do so, but only two such courses will count toward the major.

REQUIREMENTS FOR A MINOR IN HEALTH AND SOCIETY

The minor is intended for students who wish to apply the skills of their major to the areas of medicine, health care administration, health policy and planning, or the social services. The minor will also be attractive to students who want to explore a secondary interest in the health field.
Five courses are required:
- HLS 116. Introduction to Community Medicine
- HLS 201. Research in the Health Sciences
- Three courses chosen from the following list:
  ANT 216. Medical Anthropology
  ECO 236. Health Policy
  HIS 208. Health, Medicine, and Social Reform
  HIS 209. Changing Concepts of Disease
  HIS 305W. American Health Policy and Politics
  PHL 225. Ethical Decisions in Medicine
  PSC 245. Aging and Public Policy
  PSY 283. Behavioral Medicine
  SOC 262. Medical Sociology

The minor is administered by the College Center for Academic Support, which is located in 312 Lattimore Hall, and is supervised by the Health and Society Committee. Students who need help planning their minor program should seek advice from members of the Committee. The minor form must be submitted to the Center office for approval.

Further information is available from the staff in the College Center for Academic Support.

UPPER-LEVEL WRITING REQUIREMENT

All majors are required to complete HLS 116. In addition, majors are expected to take one of the following courses: HLS 208W, HLS 209W, PSC 245W, SOC 262W, and possibly ECO 236 or PHL 225W. HLS 301 can also be taken as HLS 301W.

COURSES OF INSTRUCTION

Definitive course offerings are distributed before each semester. Courses listed here carry 4 credit hours unless otherwise noted.Following are some of the recent or planned offerings.

116. Introduction to Community Medicine. This course explores health issues in American society through a multidisciplinary, community-oriented approach, in order to better understand the limitations of a strictly biomedical approach to health and health policy. Same as HIS 116. (Fall, alternate years)

201. Research in the Health Sciences. This course is not intended to train students to do research in the health fields, but rather to help them understand the research that is done. Topics include design of research, epidemiology, survey research, case-control studies, clinical trials, services research. Prerequisites: HLS 116, STAT 211. (Spring)

208. Health, Medicine, and Social Reform. Same as HIS 208/PM479.

209. Changing Concepts of Disease. Same as HIS 209.

216. Peer Health Advocacy I. Examination of the ways in which health issues can impact the lives of college students and the college environment. In addition, students learn practical skills in "conversational leadership," or how to talk appropriately with peers about their health behavior. (Fall)

217. Peer Health Advocacy II. Credit—
2 hours. Continuation of HLS 216. (Spring)

301. Senior Seminar. This seminar exposes the student to issues in the making and implementation of health policy in the United States, examining such issues as the cost of medical care, managed care, health and poverty, the medical malpractice system, health care workforce issues, and patient autonomy. (Spring)

393. Senior Project.

394. Internship.

398. Senior Thesis.

HISTORY

Celia Applegate, Ph.D. (Stanford) *Professor of History*
Theodore M. Brown, Ph.D. (Princeton)
Professor of History, of Community and Preventive Medicine, and of Medical Humanities
Stanley L. Engerman, Ph.D. (Johns Hopkins) *John Munro Professor of Economics and Professor of History*
William B. Hauser, Ph.D. (Yale) *Professor of History*
Joseph E. Inikori, Ph.D. (University of Ibadan, Nigeria) *Professor of History and of African and African-American Studies*
Richard W. Kaeuper, Ph.D. (Princeton)
Pro-fessor of History
Elias Mandala, Ph.D. (Minnesota) *Professor of History*
Dorinda Outram, Ph.D. (Cambridge) *Gladys I. and Franklin W. Clark Professor of History*
Joan S. Rubin, Ph.D. (Yale) *Professor of -History and Director of Graduate Studies*
Thomas Slaughter, Ph.D. (Princeton) *Arthur R. Miller Professor and Professor of History*
David A. Walsh, Ph.D. (Minnesota) *Professor of Art History and of History*
Stewart Weaver, Ph.D. (Stanford) *Professor of History; Chair of the Department*
Robert Westbrook, Ph.D. (Stanford) *Professor of History*
Daniel Borus, Ph.D. (Virginia) *Associate Professor of History*
Gerald H. Gamm, Ph.D. (Harvard) *Associate Professor of Political Science and of History*
Lynn D. Gordon, Ph.D. (Chicago) *Associate Professor of History*
Larry E. Hudson, Ph.D. (Keele University, U.K.) *Associate Professor of History*
Michael J. Jarvis, Ph.D. (William and Mary) *Associate Professor of History*
Matthew E. Lenoe, Ph.D. (Chicago) *Associate Professor of History*
Jean Pedersen, Ph.D. (Chicago) *Associate Professor of Humanities, Eastman School of Music, and of History*
Victoria W. Wolcott, Ph.D. (Michigan)

Associate Professor of History; Director of Undergraduate Studies
Milton Berman, Ph.D. (Harvard) *Professor Emeritus of History*
Jesse T. Moore, Ph.D. (Pennsylvania State) *Professor Emeritus of History*
John J. Waters, Jr., Ph.D. (Columbia)
Profes-sor Emeritus of History
Mary Young, Ph.D. (Cornell) *Professor*
Emeritus of History

Graduate students serve as teaching assistants in large lecture courses.

The Department of History offers programs of study leading to the B.A. degree and the B.A. degree with honors (and, on the graduate level, to the M.A. and Ph.D. degrees). The department also offers a minor in history. Nonmajors are welcome in all history courses and often become enthusiastic, successful
students of history while pursuing other interests. The history concentration is valuable not only for those considering the historian's vocation, but also for those pursuing careers in law, secondary school teaching, politics, and
communications, among others.

The department also offers 16 clusters for nonmajors to fulfill the social science divisional requirement in the Rochester Curriculum. These clusters consist of carefully selected sets of courses, and include both geographical (e.g., American History) and topical (e.g., War and Revolution) groupings.

The department offers a wide range of courses in its undergraduate program encompassing social, economic, cultural, intellectual, political, and psychological approaches to historical problems and periods. Most 100- and 200-level courses in the department are accessible to students with little preparation in history. In addition, the faculty offer 300-level seminars and courses designed for concentrators or other students interested in exploring more specialized historical problems (200-level courses designated with a "W" and all 300W courses fulfill the upper-level writing requirement).

Students concentrating in history will each have a faculty advisor. The choice of that advisor will be based on a student's particular interests in history and will be made in consultation with the Director of Undergraduate Studies. The advisor will help prospective majors plan their programs. In addition, advisors are a resource for information on courses, on making changes to a major program, on special opportunities in the major (honors, internships, etc.), and on opportunities for further study and work after graduation.

For the most current information about the Department of History and the faculty, please visit our Web site, www.rochester.edu/College/HIS.

REQUIREMENTS FOR A
CONCENTRATION IN HISTORY

Before admission to a concentration in history, students must satisfactorily complete at least two history courses. Students may then count these courses toward fulfillment of the *history concentration requirement, which consists of a total of 10 courses (or 40 credit hours), including*

- A minimum of *six* courses (or 24 credit hours) taken from members of the history department faculty; no more than *four* courses in the concentration may come from courses taken elsewhere, study abroad courses, AP credit, IB credit; or cross-listed courses taught by faculty not formally associated with the Department of History. (Please note that some HIS courses are offered by faculty in other College departments and will not count toward the *six*-course minimum). Transfer students majoring in history are required to take a minimum of *five* courses in the department, thus meeting half the major requirements in residence.
- A minimum of one course in at least *three* of the following geographical areas—Africa, Asia and the Pacific, Europe, Latin America, the Middle East, and the United States; a course covering more than one geographical area (for instance, a course on European imperialism) may nevertheless only count for one geographical area, which students designate.
- A minimum of *two* courses in each of two chronological periods—pre-1800 and post-1800; courses with substantial coverage of both periods may only count for one, which the students designate.
- *Five* history courses (or 20 credit hours) in an area of focus. In addition to nations or regions, students may choose from the following focus areas organized around a theme or approach—African and African-American History, Cultural and Intellectual History, Economic and Social History,
  History of Science and Medicine, Global
  Perspectives, Women's History; students may also choose to design a focus individually, in consultation with their departmental advisor.
- *Two* upper-level writing ("W") history courses, one of which must be on the 300 or 300/400 level and one of which must be in the students' area of focus.
- All of these specific requirements are included within the 10 required courses, and overlap is allowed between requirements—for instance, a course on Traditional Japan may count both as a course in the geographical area of Asia and the Pacific and as a course in

the pre-1800 chronological period.

- Students double-majoring in history and another department or program in the humanities or the social sciences divisions may, with the permission of the Director of Undergraduate Studies, use either one or two courses (a maximum of 8 credits) from their other major toward the fulfillment of the history major; double majors must, however, still meet the geographical and chronological distribution requirements and the 300-level seminar requirements with history courses.
- If study of a foreign language is pertinent to students' focus areas (e.g., Japanese to Asian and Asian-American history, or Russian to European history) and will be used in research for history courses, then students may, with permission of the Director of Undergraduate Studies, count up to two courses (a maximum of 8 credits) of language study toward the history major; students using foreign language credits within the major must still meet the geographical and chronological distribution requirements, the 300-level seminar requirements, and the focus area requirement with history courses. (Please note: students using foreign language study to satisfy a humanities cluster may only overlap ONE course in the cluster with the history major.)

REQUIREMENTS FOR A MINOR IN HISTORY

The minor in history consists of a total of *six* courses (or 24 credit hours), including

- A minimum of *four* courses (or 16 credit hours) taken from department faculty; no more than two courses (or 8 credit hours) may come from AP credit, IB credit, transfer courses, study abroad courses, or cross-listed courses taught by faculty members not associated with the Department of History.
- A minimum of one course from at least *two* of the following geographical areas: Africa, Asia and the Pacific, Europe, Latin America, the Middle East, the United States.
- A minimum of one course from each of *two* chronological periods: pre-1800 and post-1800.

ADVANCED PLACEMENT POLICY

Advanced Placement credit will be granted for scores of 4 or 5 on the American history, European history, or world history exams. Credit will be granted for only one AP course. This credit is elective credit and may not be used to satisfy the geographical or chronological distribution requirements in the major or minor *or* to satisfy the focus requirement in the major.

INTERNATIONAL BACCALAUREATE POLICY

International Baccalaureate *credit will be granted should a higher-level exam score of 6 or better* be received. No credit is granted for subsidiary level exams. This credit is elective credit and may not be used to satisfy the geographical or chronological distribution requirements in the major or minor *or* to satisfy the focus requirement in the major.

Note: Students may not receive more than a total of 8 elective credits for AP and IB exams.

REQUIREMENT FOR DISTINCTION IN HISTORY

To graduate with distinction in history, students must have a *GPA of 3.7 in the major* and to receive highest distinction in history, students must have a *GPA of 3.8 in the major*.

REQUIREMENTS FOR HONORS IN HISTORY

Students will be invited to apply to the honors programs. Invitations are issued at the beginning of the senior year and are based on grade-point average in the department and on progress toward finishing department requirements. To graduate with honors in history, students must complete the concentration program; complete two 300W-level history courses and HIS 391W (independent study devoted to thesis preparation); have a departmental cumulative grade-point average of at least a 3.7; and the completion of a distinguished research paper under the direction of a faculty advisor. The thesis must be of at least A– quality. Students will not receive honors for a thesis that does not meet this minimum standard. The 2-credit Honors Research Seminar (HIS 398) is encouraged.

UPPER-LEVEL WRITING REQUIREMENT

History majors fulfill the College upper-level writing requirement by taking two history courses designated with a "W." One of these two upper-level writing courses must be at the 300- or 300/400-level. These two seminars are included within the total of 10 courses (40 credit hours) required for the concentration in history.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

INTRODUCTORY COURSES

100. The Ancient World. Introduces

European history by examining the civilizations of the ancient world: the cultures of Egypt, Mesopotamia, Greece, and Rome.

102. The West and the World Since 1492. This course surveys the political, social, economic, and cultural history of Europe from the Age of Discovery to the end of the Cold War.

103. Cultural History of Ancient Greece. Same as CLA 102.

105. Traditional Japan. Explorations in the cultural and institutional history of Japan from premodern to modern times.

106. Colonial and Contemporary Africa. Explores the impact of capitalism on African socioeconomic institutions during and after the era of formal colonialism.

110. Introduction to African-American Studies. Exploration of the images and various disciplinary approaches that have contributed to our understanding of the black family experience in America, and familiarization with the concepts and theories of African-American studies as a discipline.

116. Introduction to History of

Poland. Gives an overview of more than one thousand years of Poland's history as one of the main Central-East European countries.

120. Introduction to Historical Studies. This course is intended for students new to the study of history at the college level. It explores what historians do, how they do it, and how students can hone their own skills.

145. Early America: 1600–1800. A study of the discovery, settlement, and development of America, 1580–1763.

146. Democratic America, 1800–1865. Jefferson, Jackson, party formation, popular culture, and sectionalism.

147. Industrial America, 1865–1929. Changes in national life brought about by the sustained expansion of American industry.

148. Recent America, 1929–Present.

Causes and consequences of the Great Depression.

150. Russian Civilization. Same as RUS 128.

151. Imperial Russia. The history of the Russian Empire from Peter the Great's forced "Westernization" of the Russian elite (around 1700) to the collapse of the Romanov dynasty in 1917.

153. Russia Now. Credit—2 hours.

Same as RUS 127.

154. Russia Now. Same as RUS 126.

165. African-American History I. An introduction to the study of the black American, to 1900.

166. African-American History II. A continuation of the study of the black American, from 1900.

168. The Wars of Vietnam, 1917–1980. This course examines the struggles to control Indochina among the French, Vietnamese, and Americans in the twentieth century, with special emphasis on the consequences for the social and political life of all three peoples.

169. The Transatlantic Twenties. An introduction to the history of modern art, music, film, dance, and literature, which emerged in the context of political, social, and cultural developments in Europe and the United States during the years following World War I.

172. Indians and Other Americans. Interactions between North American Indians and Euro-Americans from colonial times to the present, including the development of Pan-Indian movements.

173. American Military History. Surveys the history of American wars and the development of military institutions.

184. Modern Japan. Focus is on the modern history of Japan from 1850 into the 1990s, with emphasis on the transformation of Japan from a traditional into a modern, industrial society.

194. Crime and Punishment in European History. Exploration of crime and criminal persecutions as historical constructions; students look at some of the most famous European crimes and/or trials since the Middle Ages throughout the twentieth century.

INTERMEDIATE COURSES

200. Introduction to Archaeology. Same as AH 106.

201. The Third World. The origins of colonization and "underdevelopment" in the rise of European capitalism.

203. Economies and Societies in Latin America and the Caribbean since 1492. Same as ECO 252/AAS 252.

204. Introduction to Law—History of Federal Indian Law. Introduction to legal studying, reasoning, and writing with the field of American Indian Law being the focus.

205W. Europe since 1945. The principal actors, forces, and currents in world politics from Hitler's failure to take Moscow and the attack on Pearl Harbor to the present.

206W. The Holocaust. The history and interpretation of the Holocaust, that is the state-sponsored persecution and murder of approximately six million Jews, as well as other people perceived to be racially inferior, by the Nazi regime and its collaborators.

207. Intellectual History of Science. A study of intellectual continuity and change in science focused on "revolutionary" episodes from the sixteenth to the twentieth century.

208W. Health, Medicine, and Social Reform. Pursuit of the theme of public health and medical reform in leading writers, from different positions along the political spectrum, committed to the social and economic reorganization of modern society.

209. Changing Concepts of Health and Illness. Historical account of the way disease has been con-ceived in the Western tradition.
211. History from Myth—King Arthur and Robin Hood. Medieval stories about kingship, ideas of chivalry, socioeconomic oppression and resistance, the growth and functioning of early legal systems within the context of their historical periods.
215. The Enlightenment. Study of some of the major changes in thought in Europe in the eighteenth century with emphasis on the social and economic conditions underlying such changes.
216. Barbarian Europe. Same as AH 242.
222W. Children, Families, and the State. This course treats the lives of children and their families in the eighteenth century against the background of important issues of the day.
223. Modern France. A political, social, and cultural history of France from eighteenth-century debates over the Enlightenment and the French Revolution to twenty-first-century debates over topics such as historical memory, national identity, the integration of immigrants, and the future of the European Union.
226W. Hitler's Germany, 1914–1945. Germany in World I, the collapse of the Weimar Republic, National Socialism from beer hall to European hegemony, and the destruction of German unity.
231. British History to 1485. Combines various approaches to Medieval Britain—political, economic, social, cultural—and concentrates on the creation of a distinct High Medieval Civilization in England in the twelfth through the fourteenth centuries.
233. Nineteenth-Century European Thought. This course considers the development of European philosophical, political, religious, and aesthetic thought from the late eighteenth century to the late nineteenth century.
234. Twentieth-Century European Thought. An introduction to the main currents of European thought in the twentieth century—what historian Eric Hobsbawm has rightly termed the "Age of Extremes."
238. History of British India. Survey of the history of the Indian sub-continent from the coming of the British in the seventeeth century to its partition and independence in 1947.
243W. Dangerous Texts. Same as RUS 289.
249. The Civil War. This course examines the events that led to the Civil War and the war's impact on the nation's political, social, and economic order.
252. Cultural History of the United States, 1876–Present. The complex reactions of Americans to a world in which science, urban living, and the impersonal relations characteristic of large-scale organizations constitute a major shaping role.
254. History of the American South, 1896–1945. The political and social relations which developed in the New South. The impact of industrialization, migration, World War I, and the Great Depression.
255. Economic and Social Conditions of African Americans in the Twentieth Century. Same as ECO 253W.
258. History of Race in America. This course attempts to identify salient moments in the nation's history when race was used as an organizing principle in the construction of American public and private institutions.
260. Progressive America. This course investigates the politics and culture of the early twentieth-century reform impulse in the United States, with a special emphasis on the ways in which efforts to achieve a better America through collective action was both within and outside the American grain.
263. The Arts in American Culture. Same as AH 255.
265. Baseball in American Life. This course focuses both on how Americans have regarded the game and how the game itself has adapted to and reflected broader developments in American life.
267. American Thought, 1600–1865. Survey of leading American ideas about God, nature, the self, society, and politics, from the Puritans to Abraham Lincoln.
268. American Thought, 1865–1990. This course is a survey of leading American ideas about God, nature, truth, the self, society, and politics from the mid-nineteenth century to the end of the twentieth century.
269. Archaeology of Early America. This course uses historical archaeology and material culture studies to explore Europe's expansion into the Americas from Columbus's arrival through the American Revolution.
272. Africa's Sleeping Giant—Nigeria since the Islamic Revolution of 1804. Focus on the historical development of socioeconomic and political structures over time to explain why Nigeria, the giant of Africa, continues to slumber.
278. Contemporary Japanese Culture. Same as JPN 246.
279W. Japan at War and After. Covers the period from 1937 to the 1960s focusing on Japan's participation in the Pacific War.
280W. The Asian-American Experience. The history of Asian immigrants and Asian-Americans in the United States and Hawaii in the nineteenth and twentieth centuries.
282W. The Samurai. The origins, image, mythology, and history of the Japanese Samurai using history, literature, and film.
287. History of International and Global Health. Examines the initiation, evolution, and transformation of international and global health activities and policies over the course of several centuries.
289. History of European Exploration. Explores the effects of geographical exploration in the eighteenth and early nineteenth centuries on the nature of knowledge by examining case studies of expeditions such as those of Lewis and Clark, James Cook, and Alexander von Humboldt.

292W. Totalitarianism and Everyday Life. In this course students compare everyday life under Hitler, Stalin, and Mussolini.
296W. Women in East Asia. A history of women in the family, women and work, and women in society in three East Asian cultures.

ADVANCED SEMINARS
Advanced readings and discussion courses (HIS 302–349) provide students with the opportunity to read extensively on a limited topic and explore important historical questions in discussions and papers. Advanced research seminars (HIS 350–389) enable the student to engage in independent research and to present this research in a substantial essay.
305W. American Health Policy and Politics. Provides an understanding of the principal health institutions and their behavior.
308W. Modernity and Modernism. A study of selected topics in the history of modern thought and culture in Europe and the United States.
314W. International Human Rights. This course has three goals: (a) to study the history of human rights, (b) to analyze a series of contemporary conflicts over human rights, and (c) to explore the range of moral, philosophical, and political questions that emerge as a result.
331W. The Societ Union and the Cold War. This seminar focuses on the Soviet side of the Cold War, including the conflict's impact on Soviet culture, society, daily life, and the economy.
333W. U.S. Colloquium I. Surveys the historiography of colonial and antebellum America.
334W. U.S. Colloquium II. Explores the major interpretations of American history from Reconstruction to the late twentieth-century resurgence of conservatism.
342. Emergence of the Modern Congress. Same as PSC 318/418.
344W. When New York Was the Wild West. Explores New York's history from Seneca settlement to Seneca Falls, considering Iroquois, Dutch, English, and American periods of history.
345W. Just Wars. Considers the concept of just war and the application of just war theory to specific historical cases.
347W. The Political Economy of Food in Africa. Exploration of the idea that in the world of African peasants food does not have an independent life apart from the social relations of those who eat it.
356W. The Atlantic Slave Trade, 1650–1850. The extent to which the Atlantic slave trade retarded the development of capitalism in Africa between 1650 and 1850, and so created the conditions for the imposition of European colonial domination.
357W. Evolution of the Current World Economic Order from 1500. Deals with the economic relations between the developed and less developed parts of the world since the sixteenth century with attention given to the impact of slavery and the slave trade. Same as AAS 371/ECO 371.
373W. Sex and Gender in the American City. Explores the role of gender and sexuality in American cities from the nineteenth century to the present. Same as WST 373.
378W. Topics in Revolutionary America. Surveys recent military, political, social, economic, and cultural studies of the American Revolution (ca. 1760–1790) in local, regional, national, Atlantic, and global contexts.
382W. Topics in Twentieth-Century American Cultural History. Explores the cultural life of the United States in the pivotal period during the turn of the century.

INDEPENDENT STUDY AND RESEARCH
The department participates in various programs of study abroad. Complete details of these programs may be obtained from the Center for Study Abroad in 206 Lattimore Hall and/or the department advisor.
116A. History of Poland (Study Abroad). This course is a survey of Polish history from the Piast dynasty through the period of Jagiellonian rule, the time of the elected kings, 123 years of partitioned Poland, the 1920s and 1930s, World War II, the creation and functioning of the People's Republic, and the collapse of the communist system.
228. In Arezzo (Study Abroad)—Modern Italy 1815–1948. Same at IT 228.
391W. Independent Study. Designed for junior and senior students who wish to pursue an independent reading program with a professor; required for honors program participants. Upper-level writing credit awarded if students prepare and revise an extended essay.
393. Senior Project. For seniors writing an extended essay under faculty supervision.
394. Internship in History. Experience in an applied setting supervised on site. Approved and overseen by a University instructor.
396W. Film and History Tutorial. The course involves intensive study of a topic in a special format. Each class consists of two students and a professor who meet once a week for an hour. For every class meeting, one of the students presents a short, analytical paper on assigned reading while the other student acts as a respondent; the role of the instructor is to guide and comment but not to lecture.
398. Honors Research Seminar. Credit—2 hours. A forum in which students can present preliminary versions of their theses and get critical feedback from both their student colleagues and the instructor.

INTERDEPARTMENTAL DEGREE PROGRAMS

Students whose educational interests do not fall within one of the existing departmental majors have opportunities for special degree programs through the College Center for Study Abroad and Interdepartmental Programs. In addition, the Center administers study abroad programs.

INTERDISCIPLINARY STUDIES

The College Center for Study Abroad and Interdepartmental Programs enables students to pursue educational goals that lie outside traditional disciplines and departments. Through its faculty Committee on Individualized Interdepartmental Programs, it supervises specially constructed programs leading to the B.A. degree. These include programs tailored to the specific needs of the individual student. In recent years these individualized majors have included such diverse areas as Italian studies, law and society, and cultural studies.

COLLEGE CENTER FOR STUDY ABROAD AND INTERDEPARTMENTAL PROGRAMS

CENTER STAFF

Richard Feldman, Ph.D. (Massachusetts)
Dean of the College; Professor of Philosophy
Jacqueline L. Levine *Assistant Dean and Director*
Heidi Kozireski *Counselor*
Theodore Pagano *Counselor*
Nicole Bissell *Administrator*
Elizabeth Budd *Secretary*

COMMITTEE ON INDIVIDUALIZED INTERDEPARTMENTAL PROGRAMS

Celia Applegate, Ph.D. (Stanford) *Professor of History*
Thomas DiPiero, Ph.D. (Cornell) *Professor of French and of Visual and Cultural Studies*
Udo Fehn, Ph.D. (Technical University of Munich) *Professor of Geology; Chair of the Committee*
Suzanne J. O'Brien, B.A. (Rochester)
Associate Dean of Undergraduate Studies and Director of the College Center for Academic Support

PROGRAMS

The *Major*—interdepartmental studies leading to bachelor's degrees awarded by the College.

The *Minor*—An interdepartmental minor may also be arranged through the Center.

An *interdepartmental M.A. or M.S.* may also be arranged with the cooperation of the related departments.

Students who are interested in any of these programs are urged to discuss their plans with an advisor in the College Center for Study Abroad and Interdepartmental Programs, located in Lattimore Hall.

A student seeking an individualized interdepartmental program should begin planning no later than the second semester of the sophomore year. After discussion with two faculty members who agree to serve as advisors and meeting with an advisor in the Cen-

ter for Study Abroad and Interdepartmental Programs, the student prepares a proposal, which contains the following information: (1) a statement indicating the reasons for the particular major and how it relates to the student's educational and career goals, (2) a statement explaining why these goals can-not be met within an existing departmental major, (3) a listing of those courses that will make up the major (at least 10 in number or 40 credit hours), and (4) the names of two faculty members who have agreed to be advisors. Help in preparing the proposal is available in the College Center for Study Abroad and Interdepartmental Programs.

For example, one student who was considering either law or graduate school designed a major in American studies that included history courses in nineteenth- and twentieth-century America, courses in American literature and American politics from corresponding periods, together with supplementary courses in art and international studies.

The proposal for the interdepartmental minor requires the support of one faculty member to act as advisor. Students apply by submitting an essay, as for the major, along with a list of six courses or 24 credit hours.

Once a student's proposal is complete, it is handed in to the Center and subsequently is submitted for action to the Committee on Individualized Interdepartmental Programs.
In judging the proposal, the Committee considers the student's academic goals and attempts to judge the coherence and thoughtfulness of the proposed program.

The bachelor's degree with honors is awarded according to three criteria: (1) successful completion of 12 credits of honors coursework: two 4-credit independent study courses in the senior year, one devoted to honors -research in the fall, and another devoted to thesis writing in the spring; and one 4-credit advanced-level course or seminar; (2) completion of a senior thesis; and (3) an oral defense of the thesis. Detailed information about the requirements is available in the College Center for Study Abroad and Interdepartmental Programs in Lattimore Hall.

The bachelor's degree with distinction is awarded to students with a sufficiently high major grade-point average: 3.25 for distinction, 3.50 for high distinction, and 3.75 for highest distinction.

It is possible for students to earn the degree with both distinction and honors.

Interdepartmental Clusters may be proposed by students. A form for this purpose is available at the Center. Interdepartmental Cluster proposals include courses from three different departments.

NOTE: Proposals for concentrators must be submitted by April 1 or November 1. Proposals will not be accepted after November 1 of the senior year.

JUDAIC STUDIES

The Center for Jewish Studies of the University of Rochester promotes research, scholarship, and education in Judaism and Judaica. Through publication, lectures, fellowships, and intellectual collaboration, the Center aims to increase knowledge in the field of Jewish Studies, to provide enriched learning opportunities for students, to contribute to the intellectual life of the University, and to share its resources with the Rochester community. Jewish studies courses are offered in modern Hebrew, religion, and history, as well as other areas. For further information about offerings in Jewish studies, see the Department of Religion and Classics.

LINGUISTICS

James F. Allen, Ph.D. (Toronto) *John H. Dessauer Professor of Computer Science, Professor of Linguistics and of Brain and Cognitive Sciences*
Gregory N. Carlson, Ph.D. (Massachusetts) *Professor of Linguistics, of Philosophy, and of Brain and Cognitive Sciences*
Michael K. Tanenhaus, Ph.D. (Columbia) *Beverly Petterson Bishop and Charles W. Bishop Professor, Pro-fessor of Brain and Cognitive Sciences, of Psychology, and of Linguistics*
Joyce M. McDonough, Ph.D. (Massachusetts)
Associate Professor of Linguistics and of Brain and Cognitive Sciences; Chair of the Department

Jeffrey T. Runner, Ph.D. (Massachusetts)
Associate Professor of Linguistics and of Brain and Cognitive Sciences
Ted R. Supalla, Ph.D. (California, San Diego) *Associate Professor of Brain and Cognitive Sciences and of Linguistics*
Christine A. Gunlogson, Ph.D. (California, Santa Cruz) *Assistant Professor of Linguistics and of Brain and Cognitive Sciences*
Demetrius Moutsos, Ph.D. (Chicago)
Professor Emeritus of Linguistics
Stanley M. Sapon, Ph.D. (Columbia)
Professor Emeritus of Psycholinguistics

Visiting faculty and teaching assistants may be assigned to aid in instruction.

The field of linguistics explores the nature of human language and languages, seeking to describe what human languages are like, how languages develop and change, how it affects a society, and how people learn and use language. Since language is central to so many arenas of human endeavor, the study of linguistics makes substantial contact with a number of disciplines in the humanities, the social sciences, and the natural sciences, including cognitive science, psychology, sociology, education, anthropology, language studies, classics, computer science, philosophy, and the law. As a result of its diversity, linguistics offers exciting fields of study for students with varied inclinations and backgrounds so long as they have a deep intellectual curiosity about language. The study of linguistics offers many unexplored areas and issues that invite adventurous minds.

The linguistics major is designed to provide students with opportunities for a strong liberal arts education, as well as for pre-professional training in several applied areas. The program consists of a core of five courses, which provide a solid understanding of the study of natural language. From the core, students may then follow a number of different tracks depending on their interests.

Up-to-date information on clusters and specialized tracks is available through the depart-ment's Web page at www.ling.rochester.edu.

CONCENTRATION REQUIREMENTS IN LINGUISTICS

The linguistics concentration requires a total of 11 courses, with a minimum of eight courses parented by the Department of Linguistics. All majors must take the basic five core courses, and a senior seminar. Students must also take five additional electives, at least three of which must be at the 200 level or above. Four of these electives must fit into either a pre-approved track or an individualized track approved by the undergraduate advisor.

1. Five core courses: LIN 101, 110, 210, 220, 225
2. Five electives (at least three at the 200 level):
a. 100-level courses: LIN 102, 103, 104, 105, 162.
b. 200-level courses: LIN 205, 206, 207, 208, LIN 217/BCS 152, LIN 218/BCS 265, LIN 219/PHL 247, LIN 220, 225, 226, 227, LIN 230/BCS 264/ASL 200, LIN 235, LIN 241/BCS 261, LIN 247/CSC 247, LIN 248/CSC 248, LIN 260, 261, 262, 265, 266, 267.
3. Senior Seminar: LIN 389.

REQUIREMENTS FOR MINORS

Linguistics

Students may minor in linguistics by taking LIN 110, 210, 220, 225; plus one elective.

UPPER-LEVEL WRITING REQUIREMENT

Two of the five core courses in linguistics are designated as upper-level writing courses. All majors take these core courses, automatically satisfying the department's upper-level writing requirement.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

LINGUISTICS

101. People and Their Language. This is an introductory overview of the relationship between people and language. The course focuses on how historical, social, and cognitive factors influence language.
102. Language and Social Identity. This course examines the relationships between language and social diversity. Its aim is

to shed light on how individuals and social groups distinguish themselves on the basis of their choice of language and their sharing (or lack of it) of a common norm of social evaluation and interpretation. Same as AAS 102.

103. Language and Sexuality. This course investigates various aspects of language as used by members of sexual minority groups, focusing on language of and about gay men and lesbians, including "reclaimed epithets" (e.g., "dyke" and "queer"), gender vs. sexuality vs. sex, and the role of language in creating/maintaining sexual categories and identities. Same as WST 103.

105. Language in Advertising. The course examines the use advertisers make of language in selling their products and how it affects our perceptions of the product and ourselves. Same as FS 257F.

106. Linguistics and the Law. This course offers a critical examination of how linguistic analysis figures in legal issues and practices, a growing field known as forensic linguistics. Topics include speaker identification, the use of questions in eliciting testimony, translation and interpretation in the courtroom, and legal language. Emphasis is on understanding and assessing linguistic argumentation and how it is applied (and sometimes misrepresented and misapplied) in the domain of law.

110. Introduction to Linguistic Analysis. This course investigates the structure of human language, covering the basic techniques and concepts in the subfields of contemporary linguistic analysis. The course emphasizes work in primary material and data analysis, and focuses on developing skills in data collection and defining relevant questions for the purpose of seeking evidence that will bear on resolving theoretical and empirical questions in analysis of language. Same as
ANT 110. (Fall and Spring)

205. Historical Linguistics. This course is designed to give an introduction to the principles of historical linguistics and their practical application. Topics include genetic relations, sound change, borrowing, the comparative method and language classification, types of language contact, morphological, syntactic and semantic change, and a real linguistics.

206. History of the English Language. Same as ENG 200.

207. Old English Literature—On a Dark Track. Same as ENG 201.

208. Language Development. Same as BCS 259.

210. Introduction to Language Sound Systems. Introduces students to the principles underlying sound systems in human language. Attention is given to articulatory phonetics, with some discussion of acoustic phonetics; practice in the production, recognition, and transcription of sounds in various languages of the world, and to the fundamentals of phonological analysis and argumentation through hands-on investigation of language sound systems. Prerequisite: LIN 110.

217. Language and Psycholinguistics. Same as BCS 152. (Fall)

218. Language and the Brain. Same as BCS 265.

219. Philosophy of Language. Same as PHL 247. (Spring)

220. Introduction to Grammatical Systems. This course examines the grammatical structure of words and sentences from the standpoint of modern linguistic theory.

225. Introduction to Semantic Analysis. This course introduces students to the basic logical notation and techniques used in formal analysis of natural language meaning, primarily in terms of truth-conditions. It covers the basics of first-order logic and set theory, and investigates how meanings represented in these terms correlate with the syntactic and lexical structures of sentences of natural language. Topics include such notions as negation, conjunction and disjunction, plurality, quantification, indexicality, entailment, implicature, and presupposition. Students of graduate standing or those with strong formal backgrounds should consider starting with LIN 265/465 instead, for which this course is ordinarily a prerequisite.

226. Morphology. This course examines the structure and definition of the linguistic unit 'word,' its typology, and the relationship of the morphological component to other levels in the grammar. The course includes an introduction to analytical techniques developed by various schools of linguistics with emphasis placed on an examination of data from a range of languages based on both published descriptions and primary field data. We examine the properties of words and how they fit into the larger structure of linguistic knowledge, the relationship between words and syntactic structure (e.g., phrases and sentences) and the relationship between words and phonological structure (e.g., phonological rules and prosodic structure). (Fall)

227. Topics in Phonetics and Phonology. The course provides participants with an overview of areas of phonological and phonetic theory encapsulated in the laboratory phonology research strategy. These issues are metrical phonology, motivating constraint based versus procedural grammars, and
phonology-phonetics interfaces. The emphasis is to provide participants with the background to read articles in phonological and phonetic theory. Course requirements for the phonology section are problem sets and/or the gathering and analysis of real speech data exemplifying an experimental or laboratory approach to phonological theory/analysis or phonological generalizations. Prerequisites: LIN 110, 210.

230. Signed Language Structure. Same as BCS 264.

241. Language Use and Understanding. Same as BCS 261.

247. Natural Language Processing. Same as CSC 247.

248. Speech Recognition and Statistical Language Models. Same as CSC 248.

260. Syntactic Theory. This course picks up where LIN 220 leaves off, exploring topics in natural language syntax from a cross-linguistic perspective. The goal of the course is an approach to syntax that accounts for both language-particular as well as universal

constraints on language. Among the topics studied are phrase structure, constraints on coreference (binding), thematic roles, long- and short-distance dependencies (extraction and NP movement), constraints on unexpressed phrases (trace and control theory), and quantifier scope (logical form). Prerequisite: LIN 220.

261. Phrase Structure Grammars. This syntactic theory course examines syntactic phenomena from the perspective of phrase structure and lexicalist grammar as opposed to transformational grammar. The course examines and develops phrase structure grammar (specifically head-driven phrase structure grammar) approaches to standard syntactic problems, contrasting them where appropriate with transformational approaches. No background in non-transformational approaches is assumed. This course can be taken as LIN 261 or as LIN 461 and is meant for linguistic majors and nonmajors alike. Prerequisite: LIN 220.

262. Topics in Experimental Syntax. This course provides an introduction to experimental methods that can be used to investigate questions that are relevant for syntactic theory. Discussion covers a range of methodologies, including self-paced reading, visual world eye-tracking, magnitude estimation, and questionnaires. During the class, students learn to understand and critically evaluate research that uses various experimental methods, and learn to design and run their own experiments. Can be used towards the linguistics major, minor, or cluster.

265. Formal Semantics. This course is an in-depth introduction to the formal analysis of natural language meaning, employing techniques that have been developed in language and formal philosophy over the last century.

266. Formal Pragmatics. Within theoretical linguistics, pragmatics is (broadly speaking) the study of how language users convey meaning. The concerns of this course fall into three general areas: (1) how meaning carried by linguistic elements (such as sentences) interacts with meaning arising from inferences about speakers intentions; (2) ways of characterizing meaning, especially with respect to linguistic elements not easily handled in traditional semantic (i.e., truth-conditional) terms; (3) the role of context in determining meaning. Topics discussed include the relation between semantics and pragmatics; representations of context; truth-conditional and other types of meaning; presupposition; implicature and Grices Cooperative Principle; anaphora; information structure; speech acts. Emphasis is on developing formal methods and analyses. Prerequisite: LIN 225.

267. Topics in Syntax and Semantics. This course covers topics at the interface of syntax and semantics. No specific syntax or semantics background is required, though the equivalent of LIN 220 is recommended.

389. Senior Seminar.

391. Independent Study in Linguistics.

393. Senior Project.

399. Practicum in Linguistics. Investigation of special problems in linguistics.

LITERARY TRANSLATION STUDIES

The Certificate in Literary Translation Studies is an interdisciplinary program in the humanities that provides undergraduate students with an opportunity to study the theory and practice of literary translation through coursework in international literature, advanced literary studies, translation, language arts, and the craft of writing. In addition to required and elective courses, students may also choose to participate in domestic students in the CLTS program have the opportunity to work with the University's international literature publishing house, Open Letter.

COMMITTEE ON LITERARY TRANSLATION STUDIES

Thomas DiPiero, Ph.D. (Cornell) *Professor of French and of Visual and Cultural Studies; Senior Associate Dean of Humanities*
Kenneth Gross, Ph.D. (Yale) *Professor of English*
Beth Jorgensen, Ph.D. (University of Wisconsin, Madison) *Associate Professor of Spanish*
Bette London, Ph.D. (University of California, Berkeley) *Professor of English*
John Michael, Ph.D. (Johns Hopkins) *Professor of English and of Visual and Cultural Studies; CLTS Advisor*
Claudia Schaefer, Ph.D. (Washington University, St. Louis) *Rush Rhees Professor and Professor of Spanish*
Joanna Scott, M.A. (Brown) *Roswell S. Burrows Professor of English*

REQUIREMENTS AND PROGRAM COMPONENTS

The CLTS is best suited for students who already have training in one or more foreign languages and whose writing skills are outstanding.

There are *four formal requirements for admission* to the CLTS program, the first two to be completed before formal application to the program, and the others to be submitted with application to the program.

1. A 200-level foreign-language course or equivalent
2. An upper-level literature or culture course in student's target language
3. Writing sample (creative or expository)
4. A brief essay describing the student's interest in the program and any prior experience with foreign languages and translations

Application materials are available from the CLTS advisor or in the College Center for Academic Support. Completed applications should be returned to the advisor. In order to be able to complete all certificate requirements in time, students should make every effort to apply to the program no later than the spring of their junior year, but in any case they must apply by the first week of their penultimate semester at Rochester.

In order to receive the CLTS, students must earn a minimum GPA of 2.0 in program coursework. There are *six core components* to the CLTS program:

I. LTS 200: Studies in Translation

II. LTS 201: Studies in International Literature

III. Language Arts and the Craft of Writing

Students will choose *one course* from the selections in the following lists:

CREATIVE WRITING
ENG 275. Advanced Creative Writing: Fiction
ENG 276. Advanced Creative Writing: Poetry
ENG 277. Screen Writing
ENG 375. Seminar in Fiction Writing
ENG 376. Seminar in Poetry
ENG 377. Writing in Other Genres

ENGLISH
ENG 200. History of the English Language

LINGUISTICS
LIN 210. Introduction to Language and Sound Systems
LIN 225. Lexical Semantics
LIN 265. Formal Semantics

MODERN LANGUAGES AND CULTURES
CLT 101s/2xx. (language, literature, culture)
CLT 389. MLC Seminar

IV. Advanced Literary Studies

Students will choose *two courses* from the selections in the following lists:

ENGLISH
ENG 201. Old English Literature
ENG 202. Middle English Literature
ENG 203. Medieval Drama
ENG 204. Chaucer
ENG 206. Studies in Medieval Literature
ENG 207. English Renaissance Literature
ENG 208. Renaissance Drama
ENG 210. Shakespeare
ENG 211. Milton
ENG 213. Studies in Renaissance Literature

ENG 214. Eighteenth-Century Literature
ENG 215. Early British Novel
ENG 218. Early American Literature
ENG 220. Romantic Literature
ENG 221. Victorian Literature
ENG 222. Nineteenth-Century British Novel
ENG 225. American Romantics
ENG 226. American Realists
ENG 227. American Moderns
ENG 228. African-American Literature
ENG 230. Asian-American Literature
ENG 231. Twentieth-Century British Novel
ENG 232. Modern Literature
ENG 233. Modern Poetry
ENG 234. Modern Fiction
ENG 235. Modern Drama
ENG 236. Contemporary Fiction
ENG 237. Contemporary Poetry
ENG 238. Studies in Modern and Contemporary Literature
ENG 248. Contemporary Women's Writing

RELIGION AND CLASSICS
REL 240W. Muhammad and the Qur'an
REL 244W. Islamic Mystical Poetry
REL 250. Shiva & Shakti
REL 253. Krishna
REL 255. Hindu Goddess and Women
REL 309. The Celestial Song
REL 310. Seminar in Mahabharata
REL 313. Ramayana
REL 314. Hindu Sanskrit Poetics
CLA 210S. Roman World
ARA 148. The Arabian Nights
ARA 203. Genre and Literary Form in Arabic Literature

MODERN LANGUAGES AND CULTURES
FR 204. Contemporary French Culture
FR 205. Francophone Cultures
FR 220. Eighteenth-Century French Novel
FR 230. Nineteenth-Century French Novel
FR 261. Twentieth-Century French Novel
GER 229. Kleist and Kafka
GER 230. Poe and Hoffmann
IT 219-221. Dante
IT 222. Boccaccio
IT 245. History of Italian Culture
JPN 215. Modern Japan
JPN 233. Culture of Zen
JPN 252. Recent Japanese Fiction
JPN 254. Modern Japanese Literature
JPN 273. Japanese Women Writers
RUS 231. Great Russian Writers
RUS 235. Tolstoy's War and Peace
RUS 237. Dostoevsky

RUS 243. Chekhov and the Modern Short Story
RUS 247. Secret Nation
SP 205. Spanish Culture
SP 206. Spanish-American Cultures
SP 215/217. The Quijote/Don Quixote
SP 245. Twentieth-Century Spanish Theater
SP 249A. Stories from Spain (Nineteenth-, Twentieth-, and Twenty-First-Century Novels)
SP 256. Twentieth- and Twenty-First-Century Spanish-American Prose
SP 257. Latin American Theater and Poetry
SP 260. Latin American Women Writers
SP 262B. Cuba XXI
SP 282. U.S. Latinos/Latinas

V. LTS 395 Portfolio
This is the capstone project for the CLTS program. Under the direction of an advisor, students will complete a translation of a group of poems, a short story or novella, or an excerpt from a novel or play. The portfolio should represent a semester's independent work.

VI. Elective
This component may be an approved publishing internship or one additional course from the lists of Component III or Component IV.

CLTS students interested in pursuing a career in translating or publishing are encouraged to participate in one of the following internship programs: editorial internships with Open Letter, the University of Rochester literary imprint; international publishing internships in France, Germany, Italy, Japan, Mexico, and Spain; domestic publishing internships with publishing houses or literary magazines in New York that are involved in international literature.

MATHEMATICAL MODELING IN POLITICAL SCIENCE AND ECONOMICS

COMMITTEE ON MATHEMATICAL MODELING IN POLITICAL SCIENCE AND ECONOMICS

Jonathan Pakianathan, Ph.D. (Princeton)
Associate Professor of Mathematics;
Chair of the Committee
William Thomson, Ph.D. (Stanford)
Elmer B. Milliman Professor of Economics
Mark Fey, Ph.D. (Caltech) *Associate*
Professor of Political Science

CERTIFICATE PROGRAM

Long a domain of the natural and applied sciences, the use of mathematical techniques has gained growing acceptance in fields like political science, economics, business, and psychology. Departments in the University of Rochester have made numerous contributions to the increasingly mathematical aspects of their fields and are uniquely positioned to teach students who wish to focus on the uses of mathematics in the social sciences. This program draws on classes in economics, mathematics, and political science. Ordinarily, interested students should apply by spring semester of their junior year.

Students must fulfill all five of the requirements noted below with a minimum overall grade point average of 2.0. No course used to satisfy these requirements may be taken satisfactory/fail.
1. Calculus/linear algebra (3–4 courses): MTH 161–162 (or MTH 141–143) and MTH 165, Linear Algebra with Differential Equations.
2. Statistics (1 course): ECO 230, Economic Statistics, PSC 200/201, Applied Data Analysis/Political Inquiry, or MTH 203, Mathematical Statistics.
3. Modeling Rational Behavior (1 course): MTH 217, Mathematical Modeling in Political Science, PSC/ECO 288, Introduction to Game Theory, or ECO 207, Microeconomics.
4. Social Science Applications (3 courses): Three additional courses in political science and economics from the Courses of Instruction listed below, with at least one from each department.

5. Additional mathematics (or social science) course (1 course): Students who select MTH 203 (for statistics) and MTH 217 (for modeling) are required to take an additional social science application course rather than an additional mathematics course. All other students take an additional mathematics course from the Courses of Instruction listed below.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted.Following are some of the recent or planned offerings.

MATHEMATICS

164. Multivariable Calculus.
201. Introduction to Probability.
202. Introduction to Stochastic Proc-esses.
203. Mathematical Statistics.
208. Methods of Operations Research.
210. Financial Mathematics.
217. Mathematical Modeling in Political Science.
235. Linear Algebra.
240. Introduction to Topology.
290. Modeling Analysis and Optimization.

ECONOMICS

207. Microeconomics.
209. Macroeconomics.
220. Fair Allocation.
231. Econometrics.
256. Game Theory and Social Choice/Topics in Game Theory.
273. Economic Growth and Development.
274. Mathematical Economics.
282. Introduction to Positive Political Theory.
288. Introduction to Game Theory.

POLITICAL SCIENCE

272. Theories of International Relations.
281. Introduction to Positive Political Theory.
285. Strategy and Politics.
288. Introduction to Game Theory.

The following graduate courses are open to advanced undergraduates with permission of the instructor.

403. Mathematical Modeling.
404. Introduction to Statistical Methods.
405. Multivariate Statistical Methods.
580. Positive Political Theory.

MATHEMATICS

Frederick R. Cohen, Ph.D. (Chicago)
Professor of Mathematics
Michael E. Gage, Ph.D. (Stanford) *Professor of Mathematics*
Steven M. Gonek, Ph.D. (Michigan) *Pro-fes-sor of Mathematics; Chair of the Department*
Allan Greenleaf, Ph.D. (Princeton) *Professor of Mathematics*
John R. Harper, Ph.D. (Chicago) *Professor of Mathematics*

Richard B. Lavine, Ph.D. (M.I.T.) *Professor of Mathematics*
Saul Lubkin, Ph.D. (Harvard) *Professor of Mathematics*
Carl Mueller, Ph.D. (California, Berkeley) *Professor of Mathematics*
Douglas C. Ravenel, Ph.D. (Brandeis)
Daniel Burton Fayerweather Professor of Mathematics
Naomi Jochnowitz, Ph.D. (Harvard)
Associate Professor of Mathematics
Jonathan Pakianathan, Ph.D. (Princeton) *Associate Professor of Mathematics*
Thomas Tucker, Ph.D. (California, Berkeley)*Associate Professor of Mathematics*
Mehmet Arikan, Ph.D. (Michigan State)
Visiting Assistant Professor of Mathematics
Scott Bailey, Ph.D. (Northwestern) *Visiting Assistant Professor of Mathematics*
Dan Geba, Ph.D. (Princeton) *Assistant Professor of Mathematics*
Andrew Ledoan, Ph.D. (Illinois, Urbana)
Visiting Assistant Professor of Mathematics
Nsoki Mavinga, Ph.D. (Alabama, Birmingham) *Visiting Assistant Professor of Mathematics*
Juan Ortiz-Navarro, Ph.D. (Iowa) *Visiting Assistant Professor of Mathematics*
Nicholas Rogers, Ph.D. (Harvard) *Visiting Assistant Professor of Mathematics*
Sema Salur, Ph.D. (Michigan State) *Assistant Professor of Mathematics*
Shannon Starr, Ph.D. (California, Davis) *Assistant Professor of Mathematics*
Norman L. Alling, Ph.D. (Columbia)
Professor Emeritus of Mathematics
Alfred Clark, Jr., Ph.D. (M.I.T.) *Professor Emeritus of Mechanical Engineering, of Mathe-matics, and of Biomedical Engineering*
Samuel Gitler, Ph.D. (Princeton) *Professor Emeritus of Mathematics*
Johannes H. B. Kemperman, Ph.D.
(Amsterdam) *Daniel Burton Fayerweather Professor Emeritus of Mathematics*
Joseph Neisendorfer, Ph.D. (Princeton)
Professor Emeritus of Mathematics
Arnold K. Pizer, Ph.D. (Yale) *Professor Emeritus of Mathematics*
David D. Prill, Ph.D. (Princeton) *Professor Emeritus of Mathematics*
Ralph A. Raimi, Ph.D. (Michigan) *Professor Emeritus of Mathematics*
Sanford L. Segal, Ph.D. (Colorado) *Professor Emeritus of Mathematics and of History*
Norman Stein, Ph.D. (Cornell) *Professor Emeritus of Mathematics*
Dorothy Maharam Stone, Ph.D. (Bryn Mawr)*Professor Emeritus of Mathematics*

Teaching assistants are used to supervise recitation and review sections of first- and second-year courses.

The Department of Mathematics offers the B.A., B.S., M.A., M.S., and Ph.D. degrees. The department also offers a minor in mathematics.

Mathematics today is one of the most pervasive modes of thought—indeed a striking intellectual phenomenon of the past several decades is the use of mathematics in fields far removed from the traditional ones of the physical sciences and engineering. Some of this mathematics is "new," invented by mathematicians and others for the purpose of math-ematical study of a new field, as, for example, mathematical game theory and economics; some of it depends on new technology, as with computerized taxonomy or mathematical simulation of biological systems; some of it is "old" mathematics, finding new uses, such as the mathematical study of epidemics and birth-and-death processes. Mathematics has even found applications in fields as seemingly remote as political science and anthropology. In turn, each new area of application is an additional stimulus to mathemat-ics itself. The offerings of the De-partment of Math-ematics are intended to reflect this diversity.

Students planning to concentrate in almost any of the University's liberal arts programs, in addition to those that require some col-lege mathematics, will find one or more courses or sequence offerings in the Department of Mathematics a valuable complement to their field of interest. Students are urged to consult the departmental advisors of both mathematics and their own intended area of concentration about courses in mathematics that may be useful for their educational and career goals, and to begin the necessary or recommended courses as early as possible.

More detailed and current information can be found on the department's Web page www. math.rochester.edu/.

COURSE INFORMATION

There are three first- and second-year sequences in calculus:

- Students in the physical and engineering sciences normally choose the sequence MTH 161, 162, 164, 165. These courses are offered every semester.
- The sequence MTH 141, 142, 143, 164, 165 is intended for students who require a less fast-paced calculus sequence than MTH 161, 162. The three courses MTH 141, 142, 143 contain all of the material of MTH 161, 162 and prepare students for MTH 164 and 165. These courses are offered every semester.

MTH 164 and 165 may be taken in either order. Usually MTH 164, Multidimensional Calculus, is taken first since its subject matter is more closely related to MTH 162. However, some engineering majors require MTH 165, Linear Algebra with Differential Equations, to be completed by the end of the fall semester of the sophomore year. Other departments require MTH 163, Ordinary Differential Equations I, instead of MTH 165.

- The sequence 171, 172, 173, 174 is an honors calculus sequence for talented students interested in mathematics. The sequence emphasizes the theoretical understanding of calculus in addition to teaching technical skills. Five credits will be granted for each course satisfactorily completed instead of the usual four credits. Mathematics concentrators who complete all four semesters will be excused from the requirement to take MTH 235. A high school AP calculus course or consent of the department is required to register for MTH 171.

Both the MTH 161–164 and MTH 171–174 sequences may be entered with advanced standing and/or credit by students who do - sufficiently well on a College Entrance Exami-
nation Board advanced placement exam.

Care is taken to ensure correct placement in the appropriate mathematics sequence during freshman orientation. Placement is based upon high school background and national placement tests. In addition, once classes have begun, students may choose, or the instructors may advise, transfer to a more suitable sequence when considered appropriate.

MTH 130 is an introductory course especially recommended for students intending to pursue concentrations in the humanities.

The two-course sequence MTH 140A–141A covers all the material in MTH 141 together with a thorough presentation of the standard precalculus material.

Finally, as part of the Quest program in the College, the department offers Quest versions of MTH 161 and 162. The Quest versions of these courses fully prepare students for higher-level courses and are especially recommended for interested students.

CONCENTRATION PROGRAMS

The department offers the following undergraduate degrees: B.A. in mathematics, honors B.A. in mathematics, B.S. in mathematics, and B.S. in applied mathematics. There is also a joint concentration program in mathematics and statistics, details of which are given under the program in statistics. In addition, there is the minor in mathematics and the Certificate Program in Mathematical Modeling in Political Science and Economics.

THE B.A. IN MATHEMATICS

A set of foundational courses must be completed before acceptance into the concentration. The concentration requires eight courses of which three are core courses and five are advanced courses. In addition, students must satisfy the upper-level writing requirement.

Foundational Course Requirement

The following foundational courses must be completed before acceptance into the concentration:

- MTH 161. Calculus IA
- MTH 162. Calculus IIA
- MTH 164. Multidimensional Calculus
- MTH 165. Linear Algebra with Differential Equations

Equivalent courses may be substituted for the above. For example, any of the mathematics honors courses MTH 171, 172, and 174 may be substituted for the equivalent MTH 161, 162, and 164 courses, and MTH 173 may be substituted for MTH 165. The sequence MTH 141–143 may be substituted for the sequence MTH 161–162. Credit granted for AP courses may be used to satisfyfoundational requirements.

Core Course Requirement

Students must satisfy the following three requirements. An honors version of a course can always be substituted for the listed course.

1. MTH 235. Linear Algebra

The requirement that MTH 235 be taken can also be satisfied by completing MTH 173. MTH 235 should be taken early in the student's concentration program.

2. One of

MTH 236. Introduction to Algebra
MTH 240. Introduction to Topology

3. One of

MTH 201. Introduction to Probability
MTH 255. Differential Geometry
MTH 265. Functions of a Real Variable I
MTH 263. Ordinary Differential Equations I
MTH 282. Introduction to Complex Variables with Applications
MTH 285. Methods of Applied Mathematics

Advanced Course Requirement

In addition to the core courses, students must complete five advanced courses as follows:

- Three advanced mathematics courses:Any mathematics course numbered 200 or above (except for courses used to satisfy the core course requirement) qualifies as an advanced mathematics course.
- Two additional advanced courses with substantial mathematical content:
  Courses that employ mathematical language, reasoning, or methodology qualify. Any mathematics course numbered 200 or above qualifies, as do certain nonintroductory courses in other departments. The most common courses in other departments that qualify are courses of a quantitative nature from the social and physical sciences, engineering, computer science, or statistics, but there are other possibilities. Selections must be approved by the student's departmental advisor.

Sample Programs and Advice

Students intending graduate work in mathematics should consider MTH 236, 237, 240, 265, 282, and suitable 400-level graduate courses as electives. Students who plan to use mathematics in a physical science or engineering are urged to consider MTH 201, 255, 281, and 282 as electives. Students intending graduate work in economics, business administration, or operational mathematics, or work in a field such as systems analysis, are urged to consider MTH 201, 202, 208, and 210.

The courses constituting a concentration in mathematics do not exhaust the student's time in the junior and senior years. Prospective graduate students in mathematics would do well to learn to read a foreign language (French, German, or Russian). Other mathematical careers might involve a background in areas such as physics, biology, engineering, economics, or computer science.

Following are some typical examples of concentration programs. These are intended as suggestive, not prescriptive.

1. Pure mathematics intending graduate study: MTH 201, 235, 236, 237, 240, 265, 282, plus one additional 200-level course.
2. Pure mathematics with interest in physical science: MTH 235, 236, 240, 255, 265, 281, 282, 285.
3. Applied mathematics, economics: MTH 201, 208, 210, 235, 236, 285; ECO 207, 209.
4. Applied mathematics, biology: MTH 201, 218, 235, 236, 263, 285; BIO 121, 263.
5. Applied mathematics, physics: MTH 201, 235, 236, 280, 281, 282, 285; PHY 143.

THE HONORS B.A. IN MATHEMATICS

A set of foundational courses must be completed before acceptance into the concentration. The concentration requires seven courses of which three are core courses and four are advanced courses. At least two of the advanced courses must be at the graduate level. In addition, an independent research project is required, and students must satisfy the upper-level writing requirement.

Foundational Course Requirement

The following foundational courses must be completed before acceptance into the concentration:

- MTH 171Q. Honors Calculus I
- MTH 172Q. Honors Calculus II
- MTH 173Q. Honors Calculus III
- MTH 174Q. Honors Calculus IV

Alternatively, students may satisfy the foundational course requirement by completing MTH 161, 162, 164, 165, and 235. Equivalent courses may be substituted for the above. Credit granted for AP courses may be used to satisfyfoundational requirements.

Core Course Requirement

Students must complete the following three courses.

- MTH 236H. Introduction to Algebra I (Honors)
- MTH 240H. Introduction to Topology (Honors)
- MTH 265H. Functions of a Real Variable I (Honors)

Advanced Course Requirement

In addition to the core courses, students must complete four advanced mathematics courses, at least two of which are at the graduate level. Any mathematics course numbered 200 or above (except for courses used to satisfy the core course requirement) qualifies as an advanced mathematics course. Any mathematics course numbered 400 or above qualifies as a graduate-level course.

Independent Research Project

Students work on an independent research project in either MTH 236H, 204H, 265H, or one of their graduate courses with the agreement and under the close supervision of the instructor of the course. Upon completion, students submit a written report on the project to the department Honors Committee and present a one-hour public talk at which the members of the committee are in attendance.

Grade-Point Average Requirement

Students must complete the above program with at least a 3.25 grade-point average in order to qualify for the honors B.A. in mathematics.

THE B.S. IN MATHEMATICS

A set of foundational courses must be completed before acceptance into the concentration. The concentration requires 11 courses of which five are core courses and six are advanced courses. In addition, students must satisfy the upper-level writing requirement.

Foundational Course Requirement

The following foundational courses must be completed before acceptance into the concentration:

- MTH 161. Calculus IA
- MTH 162. Calculus IIA
- MTH 164. Multidimensional Calculus
- MTH 165. Linear Algebra with Differential Equations

Equivalent courses may be substituted for the above. For example, any of the mathematics honors courses MTH 171, 172, and 174 may be substituted for the equivalent MTH 161, 162, and 164 courses and MTH 173 may be substituted for MTH 165. The sequence MTH 141–143 may be substituted for the sequence MTH 161–162. Credit granted for AP courses may be used to satisfy foundational requirements.

Core Course Requirement

Students must complete the following five courses. An honors version of a course can always be substituted for the listed course.

- MTH 235. Linear Algebra

The requirement that MTH 235 be taken can also be satisfied by completing MTH 173. MTH 235 should be taken early in the student's concentration program.

- MTH 236. Introduction to Algebra I
- MTH 240. Introduction to Topology
- MTH 265. Functions of a Real Variable I
- MTH 282. Introduction to Complex Variables with Applications

Advanced Course Requirement

In addition to the core courses, students must complete six advanced courses as follows:

- Four advanced mathematics courses:
  Any mathematics course numbered 200 or above (except for courses used to satisfy the core course requirement) qualifies as an advanced mathematics course.
- Two additional advanced courses with substantial mathematical content: Courses that employ mathematical language, reasoning, or methodology qualify. Any mathematics course numbered 200 or above qualifies, as do certain nonintroductory courses in other departments. The most common courses in other departments that qualify are courses of a quantitative nature from the social and physical sciences, engineering, computer science or statistics, but there are other possibilities. Selections must be approved by the student's departmental advisor.

THE B.S. IN APPLIED MATHEMATICS

A set of foundational courses must be completed before acceptance into the concentration. The concentration requires nine courses of which four are core courses and five are advanced courses. In addition, students must satisfy the upper-level writing requirement.

Foundational Course Requirement
The following foundational courses must be completed before acceptance into the concentration:
- MTH 161. Calculus IA
- MTH 162. Calculus IIA
- MTH 164. Multidimensional Calculus
- MTH 165. Linear Algebra with Differential Equations
- PHY 121. Mechanics
- PHY 122. Electricity and Magnetism

Equivalent courses may be substituted for the above. For example, any of the mathematics honors courses MTH 171, 172, and 174 may be substituted for the equivalent MTH 161, 162, and 164 courses, and MTH 173 may be substituted for MTH 165. The sequence MTH 141–143 may be substituted for the sequence MTH 161–162. Credit granted for AP courses may be used to satisfy foundational requirements.

Core Course Requirement
Students must complete the following four courses. An honors version of a course can always be substituted for the listed course.
- MTH 235. Linear Algebra

The requirement that MTH 235 be taken can also be satisfied by completing MTH 173. MTH 235 should be taken early in the student's concentration program.
- MTH 201. Introduction to Probability
- MTH 265. Functions of a Real Variable I
- MTH 282. Introduction to Complex Variables with Applications

Advanced Course Requirement
In addition to the core courses, students must complete five advanced courses as follows:
- Three advanced mathematics courses:
  Any mathematics course numbered 200 or above (except for courses used to satisfy the core course requirement) qualifies as an advanced mathematics course.
- Two additional advanced courses with substantial mathematical content:
  Courses that employ mathematical language, reasoning, or methodology qualify. Any mathematics course numbered 200 or above qualifies, as do certain nonintroductory courses in other departments. The most common courses in other departments that qualify are courses of a quantitative nature from the social and physical sciences, engineering, computer science, or statistics, but there are other possibilities. Selections must be approved by the student's departmental advisor.

JOINT CONCENTRATION IN MATHEMATICS AND STATISTICS
The details for this program are given under the listings for the statistics program.

THE MINOR IN MATHEMATICS
A set of foundational courses must be completed before acceptance into the minor. The minor requires one core course and two advanced courses.

Foundational Course Requirement
The following foundational courses must be completed before acceptance into the concentration:
- MTH 161. Calculus IA
- MTH 162. Calculus IIA
- MTH 165. Linear Algebra with Differential Equation

and one of

- MTH 150. Discrete Mathematics

or

- MTH 164. Multidimensional Calculus

Equivalent courses may be substituted for the above. For example, any of the mathematics honors courses MTH 171, 172, and 174 may be substituted for the equivalent MTH 161, 162, and 164 courses, and MTH 173 may be substituted for MTH 165. The sequence MTH 141–143 may be substituted for the sequence MTH 161–162. Credit granted for AP courses may be used to satisfy

foundational requirements.

Core Course Requirement
Students must satisfy the following core course:
• MTH 235. Linear Algebra

The requirement that MTH 235 be taken can also be satisfied by completing MTH 173. MTH 235 should be taken early in the student's minor program.

Advanced Course Requirement
In addition to the core course, students must complete two advanced mathematics courses. Any mathematics course numbered 200 or above (except for MTH 235) qualifies as an advanced mathematics course.

CERTIFICATE IN MATHEMATICAL MODELING IN POLITICAL SCIENCE AND ECONOMICS

The details for this certificate are given under the heading for Mathematical Modeling in Political Science and Economics.

MATHEMATICS AND COMPUTER SCIENCE

Students interested in both mathematics and computer science are encouraged to pursue either a double concentration in mathematics and computer science, or a minor in mathematics and a concentration in computer -science.

UPPER-LEVEL WRITING REQUIREMENT

The Department of Mathematics believes that the acquisition of the ability to write coherently on a mathematical topic, in a way that is acceptable to the general mathematical community, is an essential part of a successful major in mathematics.

To satisfy the mathematics department
upper-level writing requirement, any student obtaining a degree in mathematics must pass two courses, which may be any of the following types: (1) an upper-level, four-credit mathematics course carrying a W designation, including MTH 300W, 302W, or 391W; (2) a one-credit course taken in conjunction with any 200-level mathematics course or MTH 174, with the prior approval of the instructor; (3) MTH 393W; or (4) at most one four-credit course, approved in advance by the student's advisor in the mathematics department, satisfying part of the upper-level writing requirement in another department.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

130. Excursions in Mathematics. The nature of mathematics and its application. Emphasis on concepts and understanding rather than acquisition of techniques. Intended for prospective concentrators in the humanities.
140A–141A. Calculus with Foundations. A two-semester sequence integrating the learning of calculus with precalculus mathematics. Intended for students who lack the algebra and trigonometry skills necessary to perform successfully in MTH 141.The two-course sequence covers all the material in MTH 141 together with a thorough presentation of the standard precalculus material. When taken alone, MTH 140A covers, in addition to precalculus material, the theory and techniques of the differential calculus, but no material from the integral calculus. MTH 140A (Fall) and MTH 141A (Spring).
141–143. Calculus I–III. A three-semester sequence identical in content to the two-semester sequence MTH 161, 162 described below. (Fall and Spring)
150. Discrete Mathematics. Logic, functions, algorithms, mathematical reasoning, mathematical induction, recurrence relations, techniques of counting, equivalence relations, graphs, trees, as well as specific questions given by the "Towers of Hanoi," and Euler's "7 bridges of Konigsberg problem." Required for computer science majors.
161. Calculus IA. Analysis of the elementary real functions: algebraic, trigonometric, expo-nen-tials and their inverses and composites; their graphs, derivatives, and integrals. Mean value theorem, maxima and minima, curve plotting. The fundamental theorem of calculus, with geometric and physical applications. (Fall and Spring)
161Q. Quest Calculus IA. This is the first semester of the Quest version of MTH 161–162, which places emphasis on understanding concepts as well as on learning techniques. Students contemplating majoring in mathematics as well as others desiring a strong foundation in calculus are encouraged to take this course or the honors sequence.
162. Calculus IIA. Techniques of integration. Improper integrals, l'Hopital's rules. Infinite series, Taylor's series in one variable. Plane curves, parametric equations, vectors in two and three dimensions, lines and planes, vector-valued functions, velocity and acceleration, arc length, curvature. Prerequisite: MTH 161 or equivalent. (Fall and Spring)
NOTE: Either MTH 164, 163, or 165 can be taken after MTH 162 or 143. The usual procedure would be to take MTH 164 followed

by 165 or 163, but see Course Information on page 80.

162Q. Quest Calculus IIA. This is the second semester of the Quest version of MTH 161–162, which places emphasis on understanding concepts as well as on learning techniques. Homework includes more challenging and occasionally more theoretical problems. (Fall)

163. Ordinary Differential Equations I. Elementary methods, linear equations, and systems with constant coefficients, solutions in series, special functions, phase plane analysis and stability, Laplace transform, extremal problems. Prerequisite: MTH 143, 162, or 172. Equivalent to ME 163. (Fall and Spring)

164. Multidimensional Calculus. Differentiation and linear approximation, extrema, Taylor series. Line, surface, and volume integrals; coordinate changes, Jacobians. Divergence theorem, Stokes' theorem. Determinants and matrices in N-dimensional vector spaces. Prerequisite: MTH 143, 162, or 172. Equivalent to ME 164. (Fall and Spring)

165. Linear Algebra with Differential Equations. Matrices, vector spaces and linear transformations, eigenvalues and eigenvectors, first-order differential equations, constant coefficient linear equations, systems of equations, applications to science, engineering, and computer science. Prerequisite: MTH 143, 162, or 172. (Fall and Spring)

171–174Q. Honors Calculus I–IV. Credit—5 hours for each course in this sequence. An honors sequence covering the material of MTH 161–164 in greater depth from the standpoint of both theory and applications. Students completing this sequence successfully will have met the requirements of MTH 235 and can begin taking upper-level courses immediately.

190. Topics in Problem Solving. This course covers some general techniques and approaches to solving difficult nonstandard problems such as those on Putnam examinations.

200. Transition to Advanced Mathematics. Introduces some of the basic techniques and methods of proof used in mathematics and computer science. Methods of logical reasoning, mathematical induction, relations, functions, and more. The course concludes with an application of the techniques learned to either group theory or real analysis. Prerequisite: MTH 163, 164, or 165. (Spring)

201. Introduction to Probability. Probability spaces; combinatorial problems; random variables and expectations; discrete and continuous distributions; generating functions; independence and dependence; binomial, normal, and Poisson laws; laws of large numbers. Prerequisite: MTH 162 or equivalent; MTH 164 recommended. Same as STT 201. (Fall)

202. Introduction to Stochastic Proc-esses. Theory and applications of random processes, including Markov chains, Poisson processes, birth-and-death processes, random walks. Prerequisite: MTH 201. Same as STT 202.

203. Introduction to Mathematical Statistics. Principles of statistical decision theory, point and interval estimation, tests of hypotheses, multivariate normal distribution, linear hypotheses, selected topics. Prerequisite: MTH 201. Same as STT 203. (Spring)

208. Operations Research. Linear and nonlinear programming, sensitivity analysis, shipping and assignment problems, game theory, genetic algorithms, flow problems. (Fall)

210. Introduction to Financial Mathematics. An introduction to some of the mathematical concepts and techniques underlying finance theory. The main financial applications are to arbitrage pricing theory and option pricing. Prerequisite: MTH 201.

215. Chaos, Fractals, and Computer Graphics. The course surveys fractal geometry with applications to chaos theory and related computer software. Prerequisite: MTH 141, 161, or 171 or permission of instructor.

216. Mathematical Logic I. Propositional calculus, functional calculus of first and higher order, the decision problem, consistency, completeness. Same as PHL 216.

217. Mathematical Modeling in Political Science. Elementary game theory applications (Nash Equilibria, Prisoner's Dilemma, Chicken), measures of voting power, social choice (Arrow's Theorem).

218. Introduction to Mathematical Models in Life Sciences. This course is aimed at building problem-solving ability in students through the development of mathematical models for certain real-life situations in the social and biological sciences. MTH 218 concentrates on axiomatic models and those involving autonomous systems of differential equations. Topics are selected from biology and political science, including voting theory and Arrow's Theorem. Prerequisite: MTH 161.

230. Number Theory with Applications. Divisibility, primes, congruences, quadratic residues and quadratic reciprocity, and primitive roots, with applications to cryptology and computer science.

235. Linear Algebra. Finite-dimensional vector spaces over R and C axiomatically and with coordinate calculations. Forms, linear transformations, matrices, eigenspaces. Prerequisite: MTH 164 or 165. (Fall and Spring)

236. Introduction to Algebra I. An introduction to basic algebraic structures, groups, rings, fields, with applications to specific examples. Prerequisite: MTH 235. (Spring)

236H. Introduction to Algebra I (Honors). An honors version of MTH 236.

237. Introduction to Algebra II.
Continuation of MTH 236 covering field theory and Galois theory including proofs of the impossibility of "trisecting angles," "doubling the cube," "squaring the circle," and "solving 5th-degree polynomials."

238. Combinatorial Mathematics. Permutations and combinations; enumeration through recursions and generating functions; Polya's theory of counting; finite geometrics and block designs; counting in graphs.

240. Introduction to Topology. Introduction to topology. Review of set theory. Metric spaces and topological spaces. Functions and continuous functions. The concepts of convergence, completeness, connectedness, and compactness. Applications to surfaces.

240H. Introduction to Topology
(Honors). An honors version of MTH 240**.**
247. Theory of Sets. Sets, relations, mappings; equivalence, order; cardinals, ordinals, transfinite arithmetic; axiom of choice and equivalents.
248. Theory of Graphs. Paths, circuits, trees. Bipartite graphs, matching problems. Unicursal graphs, Hamiltonian circuits, factors. Independent paths and sets. Matrix representations. Planar graphs. Coloring problems. Prerequisite: MTH 235 recommended. Same as CSC 248.
250. Introduction to Geometry. Foundations of geometry, isometry, similarity, inversions; introduction to affine, projective, and various non-Euclidean geometries.
255. Differential Geometry I. Torsion, curvature, the differential geometry of curves and surfaces in 3-space. Prerequisite: MTH 164 or 174.
256. Differential Geometry II. Riemannian geometry. Prerequisite: MTH 255.
263. Ordinary Differential Equations II. A second course in ordinary differential equations in the real domain. Prerequisite: MTH 163 or equivalent and MTH 235, or consent of the instructor.
265. Functions of a Real Variable I. Real number system, uniform continuity, mean value theorems, bounded variation, Riemann- Stieltjes integral, sequences of functions. Prerequisites: MTH 163 and 164, or 174, or equivalent. (Fall)
265H. Functions of a Real Variable I (Honors). An honors version of MTH 265.
266. Topics in Real Analysis. A continuation of MTH 265/265H. Possible topics: a rigorous exposition of Fourier analysis; multivariable analysis; elementary theory of Hilbert and Banach spaces. Prerequisite: MTH 265/265H or equivalent.
280. Introduction to Numerical
Analysis. The numerical solution to mathematical problems by computer. Linear systems, approximation, integration, and differential equa-tions. Floating point arithmetic and conse-quent pitfalls of computation. Prerequisite: MTH 162 or equivalent. Same as STT 280.
281. Introduction to Fourier Series, Orthogonal Polynomials, and Boundary Value Problems. Fourier series and convergence theorems. Orthogonal polynomials. Applications to some partial differential equations. Fourier transforms. Prerequisites: MTH 163 and 164 or 174. Equivalent to ME 201. (Fall)
282. Introduction to Complex Variables with Applications. Complex differentiation and integration, analytic functions, singularities, residues, poles, series-expansions, conformal mapping, with some applications. This course is independent of MTH 281. Prerequisite: MTH 164 or 174. Equivalent to ME 202. (Spring)
285. Methods of Applied Mathematics. Minimum principles, eigenvalues and dynamical systems, constraints and Lagrange multipliers, applications to electrical networks, differential equations of equilibrium, calculus of variations, stability and chaos, nonlinear conservation laws.
290. Mathematical Biology. Introduces students to some standard mathematical methods/models in biology, including ordinary/partial differential equations, dynamical systems, and Stochastic processes. Applications to various topics in biology such as population biology, genetics, ecology, models of evolution, and DNA sequencing are pursued. Prerequisite: MTH 162 or equivalent.
300W. History of Mathematics. The nature and style of mathematics in ancient Babylonia, Egypt, and Greece; medieval and Renaissance Europe; seventeenth-century Europe; and some aspects of the development of abstraction and rigor in analysis and set theory since 1700. Some of the actual methods and problems of the eras studied are part of the material of the course. (Spring)
302W. History of Mathematics II. The style and development of European mathematics from roughly 1650 to roughly 1950. The development of calculus and analysis, algebra, probability, geometry (including non-Euclidean geometry), set theory, are all touched on. The introduction of the idea of rigorous proof. This course is independent of MTH 300W and may be taken independently of it.
391. Independent Study in Mathematics. Special work arranged individually.

The following graduate courses are open to advanced undergraduates with permission of the instructor.

436. Algebra I. Rings and modules, group theory. Galois theory. Prerequisite: MTH 237. (Fall)
437. Algebra II. Multilinear algebra, quadratic forms, simple and semi-simple rings and modules. Prerequisite: MTH 436. (Spring)
440. General Topology I. Continuity. Compactness, connectedness, metrizability. Product spaces. Prerequisite: MTH 265. (Fall)
443. Algebraic Topology I. The combinatorial structure of complexes and the homology of polyhedra. Applications of algebraic techniques in topology to classification of surfaces, fixed point theory, and analysis. Prerequisites: MTH 436 and 440. (Spring)
453. Differentiable Manifolds. Differentiable manifolds, mappings and embeddings, exterior differential forms, affine connections, curvature and torsion. Riemannian geometry, introduction to Lie groups and Lie algebras.
463. Partial Differential Equations. Studies the main tools and classes of PDEs.
467. Theory of Analytic Functions I. Cauchy theorems, Taylor and Laurent series, residues, conformal mapping, analytic continuation, product theorems. Prerequisite: MTH 265 or equivalent. (Fall)

471. Measure and Integration. Lebesgue measure on the line. Measure spaces. Integration. Convergence theorems. The Radon-Nikodym theorem. Differentiation. Fubini's theorem. The function spaces Lp and C. Prerequisite: MTH 265 or equivalent. (Spring)
472. Functional Analysis I. Banach spaces. Dual spaces. Riesz theorem. Hilbert space. Fourier series. Projective and unitary operators. Spectral analysis of completely continuous self-adjoint operators. Applications. Prerequisite: MTH 471. (Fall)

A more detailed description of other graduate-level courses may be found online at www.rochester.edu/GradBulletin/.

MODERN LANGUAGES AND CULTURES

Thomas DiPiero, Ph.D. (Cornell) *Professor of French and of Visual and Cultural Studies; Senior Associate Dean of Humanities*
Susan Gustafson, Ph.D. (Stanford) *Karl F. and Bertha A. Fuchs Professor of German Studies and Professor of German*
Kathleen Parthé, Ph.D. (Cornell) *Professor of Russian; Director of Russian Studies*
David Pollack, Ph.D. (California, Berkeley) *Professor of Japanese*
Claudia Schaefer, Ph.D. (Washington University, St. Louis) *Rush Rhees Professor and Professor of Spanish*
Joanne Bernardi, Ph.D. (Columbia) *Associate Professor of Japanese*
John Givens, Ph.D. (Washington) *Associate Professor of Russian*
Beth Jörgensen, Ph.D. (Wisconsin) *Associate Professor of Spanish*
Cilas Kemedjio, Ph.D. (Ohio State) *Associate Professor of French*
Ryan Prendergast, Ph.D. (Emory) *Associate Professor of Spanish*
Rául Rodríguez-Hernández, Ph.D. (Cornell) *Associate Professor of Spanish*
Donatella Stocchi-Perucchio, Ph.D. (Cornell) *Associate Professor of Italian*
Jennifer Creech, Ph.D. (Minnesota) *Assistant Professor of German*
Robert Doran, Ph.D. (Stanford and Sorbonne Nouvelle-University of Paris III) *Assistant Professor of French*
June Hwang, M.A. (California, Berkeley) *Assistant Professor of German*
Friederike Seligman, Ph.D. (Michigan) *Assistant Professor of Russian*
Andrée R. Douchin, Ph.D. (Rochester) *Senior Lecturer in French*
Laura Givens, M.A. (Washington) *Senior Lecturer in Russian*
Berthe Kouroublakis, M.A. (NYU) *Senior Lecturer in Spanish*
Alexandra Kuzmich, M.A. (University of Kansas) *Senior Lecturer in German*
Anna Maslennikova, Ph.D. (St. Petersburg) *Senior Lecturer in Russian*
Luisa O'Keefe, M.A. (SUNY, Buffalo) *Senior Lecturer in Italian*
Fumino Shino, R.N. (Kumamoto University) *Senior Lecturer in Japanese*
Mariko Tamate, M.B.A. (Temple) *Senior Lecturer in Japanese*
Shifang Yu, B.A. (Fujian University) *Senior Lecturer in Chinese*
María Córdoba Gómez, M.A. (Granada University) *Lecturer in Spanish*
Philip R. Berk, Ph.D. (Pittsburgh) *Professor Emeritus of French Literature*
Wilhelm Braun, Ph.D. (Toronto) *Professor Emeritus of German Literature*
Patricia Herminghouse, Ph.D. (Washington University) *Karl F. and Bertha A. Fuchs Professor Emerita of German Studies*
Robert ter Horst, Ph.D. (Johns Hopkins) *Professor Emeritus of Spanish*

A supplementary staff of part-time faculty, foreign exchange students, and teaching assistants is assigned to aid in the instruction of language. Please consult the MLC Web site for details: www.rochester.edu/College/MLC/.

The Department of Modern Languages and Cultures offers programs of study in many of the major modern foreign languages, cultures,

and literatures (leading to the B.A. degree). The M.A. is awarded in comparative literature, French, German, and Spanish. Students interested in teaching should consult the Warner School for information on the M.A.T.

LANGUAGE INSTRUCTION

Language instruction is offered in seven modern languages: Chinese, French, German, Italian, Japanese, Russian, and Spanish. Students wishing to enter a language sequence should consult with a departmental advisor for proper placement, which is based on the student's previous training as determined by scores on placement tests, previous language study (AP, IB, etc.), and the departmental placement questionnaire. Departmental advisors are available during freshman orientation and preregistration periods as well as throughout the academic year.

Students with no previous exposure to a language should begin with the 101 course. Students with previous exposure to a language are encouraged to speak with a departmental advisor for placement at the appropriate level. Students are not permitted to register for or receive credit for a particular language course if they have already achieved proficiency at the level of that course. For courses 101–104 students are not permitted to register for a lower-numbered course after successfully completing a higher-numbered course.

Students with previous language study who wish to enter advanced language or literature courses should consult with advisors in their field of interest. Students interested in course credit for advanced placement should see the undergraduate advisor in the particular language. For nonconcentrators, foreign language skills provide an extra edge in applying for graduate study or for employment that requires travel or work in the international community.

Programs such as the Certificate in Management Studies and the International Relations Certificate in combination with a language concentration offer students wider career horizons. Consult Simon School advisors or the Department of Political Science for more information.

ADVANCED COURSES OF STUDY

Students with advanced knowledge of a language (i.e., with five or more semesters of college study completed) can choose courses from three broad areas. Literature courses permit the student to analyze critically the aesthetic, philosophical, and political complexities of a society's literary traditions. Culture courses examine both literary and nonliterary texts of all kinds, from essay to film to fashion to comics. Advanced language courses provide further study of language itself its production, history, and structure.

The department-wide program in comparative literature studies literary and cultural texts from perspectives which cross traditional boundaries and national frontiers. International by definition, comparative literature systematically and thoughtfully questions linguistic and cultural limits. It examines literature and other texts in relation to their historical context and establishes a dialog among art forms. Courses in comparative literature, all of which are taught in English, encourage the participation of students from all disciplines and emphasize the formation of critical attitudes and interpretive skills. Popular culture, globalization, media and technology, consuming texts, and issues of race, class, and gender all pertain to this program of study.

CLUSTERS IN MODERN LANGUAGES AND CULTURES

Modern languages and cultures offers multiple options for humanities clusters, many of which can easily be turned into a minor by adding two more courses. A minor is only five courses.

If you would like to: (1) start a new language or culture area; (2) continue with a language you began in high school; or, (3) do more advanced work in a language you know fairly well, then there is a choice of clusters for you in every language section, as well as in comparative literature and Russian studies (which offers several humanities clusters and one in the social sciences).

Consult the Department of Modern Languages and Cultures home page as well as the cluster search engine for the most up-to-date information on cluster choices, and if you have any questions, get in touch with the department and you will be directed to the appropriate undergraduate advisor for the area in which you are interested.

STUDY ABROAD OPPORTUNITIES

The department actively encourages students to seek a minimum of one semester of foreign study. Work completed in an approved study abroad program may be given concentration credit up to a maximum of four courses in French, German, Italian, Japanese, Russian, and Spanish. Students interested in studying abroad should consult with their departmental advisor and seek the assistance of the College Center for Study Abroad and Interdepartmental Programs located in Lattimore Hall. Modern languages and cultures offers summer study abroad.

Semester and Academic Year Programs

The University is affiliated with the Institute of European Studies, which offers semester and academic year programs in France (Paris,

Nantes), Japan (Tokyo and Nagoya), Spain (Madrid, Salamanca, and Granada), and Argentina (La Plata), as well as with the Council on International Education Exchange programs in Russia (St. Petersburg), the People's Republic of China (Beijing, Nanjing, and Fudan), the Dominican Republic, and Chile. Qualified students may also participate in internship programs in the German Bundestag, the French National Assembly, and the Spanish Cortes, as well as in various political, business, medical, and performance internships in Bonn, Paris, and Madrid. The Skalny Center for Polish and Central European Studies provides students with an opportunity to develop an interdisciplinary knowledge of Polish and Central European politics, history, cultures, and international relations with Eastern (Russia/Soviet Union/Post–Soviet States) and Western Europe, as well as with the United States. An interdepartmental major or minor in Polish and Central European studies (PCES) may be designed through the Skalny Center and is administered through the College Center for Study Abroad and Interdepartmental Programs. The Skalny Center itself offers a Certificate in Polish and Central European Studies, and a study abroad program in Poland. Upperclass students are
eligible to compete for exchange fellowships with the University of Cologne (Germany) and the University of Haute-Bretagne (Rennes, France); the awards cover full tuition and living expenses for one academic year.

Study on Location in Arezzo, Italy. Special Degree Program in Italian Studies. The University of Rochester currently offers a one-semester, interdisciplinary program in Italian studies in Arezzo, Italy. The program is directed on campus by Professor Stocchi-Perucchio (Italian) and an advisory committee, in collaboration with a University of Rochester–appointed director on location, Donna Logan. The program is directed by University of Rochester faculty on a rotating basis and administered through the College Center for Study Abroad and Interdepartmental Programs.

The Arezzo program takes place in the spring, offers 16 credits, and may be taken as partial fulfillment of the requirements:
a. for the minor in Italian
b. for an individualized interdepartmental concentration in Italian studies

Students interested in option B may create an interdepartmental concentration through the College Center for Study Abroad and Interdepartmental Programs.

Summer Programs
Modern languages and cultures (MLC) sponsors special intensive language programs abroad during the summer for students of French in Rennes, France; for students of German in Berlin, Germany; for students of Italian in Padua, Italy; for students of Spanish in Quito, Ecudador, and Oaxaca, Mexico; and for students of Russian in St. Petersburg, Russia. Some programs require the completion of one semester of foreign language studies at the University (consult with program).

Through the bequest of Mildred R. Burton, summer study grants to University of Rochester programs are available in annual competitions administered by the department.

CONCENTRATION PROGRAMS

The department offers the B.A. degree in comparative literature, French, German, Japanese, Russian, and Spanish; it offers minors in comparative literature, French, German, Italian, Japanese, Russian, Spanish, and Latin American studies. For specific courses offered in each of these subject areas, please consult the undergraduate advisor for the section and the MLC Web site. Courses in Polish are also offered through MLC as part of the certificate program in Polish and Central European studies. (Instruction in Arabic, Classical Greek, Latin, and Hebrew is offered in the Department of Religion and Classics.)

Concentration programs are balanced between advanced language preparation and literary and cultural studies. In many upper-level courses, the reading and most of the writing and coursework are in the original language. Concentrators are strongly urged to strengthen their background for literary studies by taking related courses in English literature, film, fine arts, history, music, philosophy, religion and classics, visual studies, or women's studies.

REQUIREMENTS AND RECOMMENDATIONS FOR MAJOR CONCENTRATIONS

All MLC majors follow a common model outlined below. Within each section specific course requirements vary.
Eleven courses are required for a major.
1. Five to seven area core courses (from the national language or comparative literature section); the language area core begins with 151–152. Students who place out of 151–152 take the equivalent number of additional electives, to be chosen in consultation with their advisor.
2. Two to four area electives, decided upon in consultation with the undergraduate advisor for the section. Students who place out of 151-152 may take up to two courses in allied fields outside of the department.
3. Two department-wide requirements (MLC core):
a. CLT 101 or another approved CLT course introducing the critical study of language, literature, and culture

b. CLT 389 (Major Seminar)

MLC Core

MLC 1: Introduction to Language, Literature, and Culture. A primary examination of the concepts of culture, language, and literature, which form the foundation of the MLC program. This requirement may be fulfilled by any section of CLT 101, or by another CLT course chosen in consultation with the student's under--graduate advisor. This component should optimally be taken by the fall of the junior year.

MLC 2: Major Seminar. A department-wide seminar introducing students to the fundamental texts of comparative literary and cultural theory. Successful completion of the MLC Major Seminar qualifies students for consideration for admission to the honors program. Students are strongly urged to enroll in the Major Seminar in their junior year. The MLC Major Seminar is offered every semester.

French

1. Concentrators are required to take the following courses:

a. Three core courses: FR 200, 202, 204

b. The elective core: six additional courses above the 114 level in French. In order to achieve a historical balance to the concentration, students must complete at least one pre-1900 course.

c. The MLC core

2. Concentrators are expected to consult with the French undergraduate advisor before reg-istering for courses.

3. Concentrators are urged to consider studying in a French-speaking country for a year, a semester, or a summer. The University is affiliated with the IES program at Paris and Nantes, the Educational Programs Abroad internship in the French National Assembly, and the Paris Film Program. Work done in an approved study abroad program may be given concentration credit up to a maximum of four courses. Students are especially encouraged to participate in the department's six-week summer program in Rennes, France.

4. Concentrators intending to teach French at the secondary level or to do graduate work in French are advised to acquire a reasonable facility in another foreign language.

German

1. Concentrators are required to take the following courses:

a. Four core courses: GER 200, 202, 203, 204, 205, or 206

b. The elective core: five additional courses above the 206 level in German. In order to achieve a reasonable balance to the concentration, students are encouraged to complete at least one course focusing on the period before 1848, and another on the period 1848–1933. With the approval of the undergraduate advisor up to two electives may be fulfilled by advanced-level courses taken in another department or by GER 151 and/or GER 152.

c. The MLC core

2. Concentrators are expected to consult with the German undergraduate advisor before registering for courses.

3. Concentrators are urged to consider studying in a German-speaking country for a year, a semester, or during the summer. The University is affiliated with the IES programs in Frei-burg, Vienna, and Berlin, the Educational Programs Abroad internship programs in Bonn and Cologne, and the Berlin Summer Program. The German section also has a unique exchange program with the University of Cologne. Work completed in an approved study abroad program may be given concentration credit up to a maximum of four courses in German.

4. Students intending either to teach German on the secondary level or to undertake graduate work are advised to acquire, at the minimum, reading proficiency in at least one other foreign language.

Japanese

1. Language emphasis: eight consecutive courses in Japanese language; three additional courses from at least two different groups: culture, film, literature; and CLT 389 (MLC Major Seminar).

2. Culture emphasis: six consecutive courses in Japanese language; five additional courses from at least two different groups (culture, film, literature); and CLT 389 (MLC Major Seminar) or Senior Thesis (by application only).

3. CLT 389 (MLC Major Seminar)/JPN 393 (Senior Honors Thesis). JPN 393 may be substituted for by permission only. JPN 393 is a two-semester course requiring extensive bibliographical preparation and research leading to a substantial research paper.

A study abroad program in Japan typically entails third-year Japanese and three or four Japan-related courses in English.

Work completed in an approved study abroad program may be given concentration credit up to a maximum of four courses in Japanese. Credit for study abroad must be arranged in advance with the major advisor.

Russian

1. Concentrators are required to take the following courses:

a. Core courses: at least two language courses at the 200 level (for example, 202, 209) and two courses in Russian literature, one of which is based in the nineteenth century, and the other in the twentieth century.
b. Electives: students who choose to count 151–152 towards the major should choose at least three additional courses in Russian language, literature, or culture. Others choose five electives in Russian/Russian studies.
c. The MLC core

2. Students are strongly encouraged to work on their language skills throughout their program, both with courses at the University of Rochester (for example, 114, 204, 209) and, if possible, on our summer program in St. Peter--s-burg (for which they receive up to 6 credits towards concentration requirements), or a semester-long program in Russia.

An interdisciplinary concentration in Russian studies is also available. See the separate entry in this bulletin, page 128.

Spanish

1. Concentrators are required to take the following courses:
a. Three core courses: SP 200, 203, and 202 or 204
b. The elective core: six additional courses above the 200 level in Spanish. In order to achieve a reasonable balance to the concentration, students are encouraged to include at least one of the two culture courses, SP 205 or 206. With the approval of the undergraduate advisor up to two electives may be fulfilled by advanced-level courses taken in another department or by SP 151 and 152 taken at the University of Rochester.
c. The MLC core

2. Concentrators are expected to consult with the Spanish undergraduate advisor before registering for courses.
3. Concentrators are urged to consider studying in a Spanish-speaking country for a year, a semester, or during the summer. The University is affiliated with the IES in Madrid,
Barcelona, Granada, and Salamanca and the Council on International Education Exchange with programs in Chile, the Dominican Republic, Argentina, and Brazil. Work completed in an approved study abroad program may be given concentration credit up to a maximum of four courses in Spanish.
4. Students intending either to teach Spanish on the secondary level or to undertake graduate work are advised to acquire, at the minimum, reading proficiency in at least one other foreign language.

Comparative Literature

The major in comparative literature provides students with work in a wide range of literature, culture, and theoretical approaches to subjects such as popular culture, film, global media, and cross-cultural influences. This major is designed especially for students with interests in interdisciplinary approaches to
literature and culture. The major in comparative literature consists of a minimum of 11 courses as follows:

1. Concentrators are required to take the following courses:
a. At least five courses in one area of literature and/or culture.
b. Four courses *either* in a second area of literature and/or culture *or* four courses that emphasize theory in comparative litera-ture or in related programs and departments (such as English, art history,
film and media studies, philosophy, music), chosen in consultation with the advisor.
c. The MLC core

2. Concentrators are expected to consult with the comparative literature undergraduate advisor before registering for courses. Work completed in an approved study abroad program may be given concentraton credit.

REQUIREMENTS AND RECOMMENDATIONS FOR MINORS

Five courses are required for the minor, which begins at the 151 level or above (101 for CLT).

Minor in Comparative Literature

The minor in comparative literature provides students with work in a wide range of theoretical issues as they relate to literature and culture within interdisciplinary contexts. Students take five courses in comparative literature and theory; some may be selected from other programs (e.g., English, art history, film and media studies), in consultation with the advisor. Concentrators in a modern language may use some of their major courses toward a minor in comparative literature.

Minors in Modern Languages

Language minors give students sufficient facility in the use of a foreign language to read sources in the major field with ease, to converse with some facility, and to have knowledge of other lands, their history, their institutions, and their artistic achievements. The minor is not thought of as giving students a total picture of a field that is too large even for an undergraduate major. Rather, it is to give students a

coherent set of courses from which they can branch out into the more thorough study of their given field.

Students minoring in languages are urged to study abroad for a year, a semester, or during the summer. The University is affiliated with the IES programs in Freiburg, Nantes, Paris, Tokyo, Nagoya, Madrid, and Mexico City as well as with the Council on International Education Exchange programs in St. Petersburg, Beijing, Nanjing, and Fudan. Students are also encouraged to investigate internships available through Educational Programs Abroad in Bonn, Paris, and Madrid. Up to two advanced courses in an approved study abroad program may be approved for credit towards the minor.

Minor in Chinese
The minor in Chinese requires 6 courses beginning with CHI 101. Students may combine language, literature, and culture courses selected from the offerings of the Chinese section.

Minor in French
The minor in French requires five courses beginning at FR 151. These normally include FR 151–152 (Intermediate French), FR 200 (Advanced French), FR 202 (Introduction to French Literature), FR 204 (Contemporary France), and FR 206 (French Cultural Traditions). With permission of the undergraduate advisor, another 200-level course may be substituted for one of the above. Students may fulfill requirements for the minor through Study Abroad.

Minor in German
The minor in German requires five courses beginning at GER 151. These normally include GER 151–152 (Intermediate German), GER 200 (Advanced German), GER 202 (Contemporary German Issues), GER 203 (Introduction to German Literature), and GER 205 (Nietzsche) or GER 206 (Freud). Study abroad may partially satisfy the requirements for the minor and is highly recommended.

Minor in Italian
The minor in Italian requires an intermediate level of competence in the language. Typically this can be achieved with the successful completion of IT 151. In addition, the minor requires four upper-level courses in Italian. IT 157/207 (Italian in Italy) and a maximum of two courses taken abroad within non–University of Rochester programs may be taken as partial fulfillment of the requirements for the minor in Italian. Students are encouraged to participate in the University of Rochester semester study on location in Arezzo, Italy. *All credits at the level of IT 151 or above* earned in the Arezzo
Program can apply to the minor in Italian.

Minor in Japanese
The minor in Japanese requires five courses beginning with JPN 101. Students may combine language, literature, and culture courses selected from the offerings of the Japanese section.

Minor in Russian
The minor in Russian requires five courses beginning at RUS 151. Students may combine language and literature courses selected from the offerings of the Russian section of MLC.

An interdisciplinary minor in Russian studies is also available. See the separate entry in this bulletin, page 129.

Minor in Spanish
The minor in Spanish requires five courses beginning at SP 151. These normally include SP 151–152 (Intermediate Spanish) and SP 200 (Advanced Spanish). Study abroad
may satisfy some requirements of the minor.

Minor in Latin American Studies
The minor in Latin American studies can serve to complement the student's major field of concentration by giving him or her a broad view of Latin American cultures and their relations to the United States and the rest of the world.

Five courses with Latin American content are required for the minor, of which three must be at the 200-level from the Department of Modern Languages and Cultures, and two from related areas such as history, political science, and anthropology. The minor must be approved by the Spanish section in its beginning stages.

Normal offerings in the Department of Modern Languages and Cultures include:
- SP 204. Spanish-American Literature: 1800 to Present
- SP 206. Spanish-American Cultures
- SP 255. Twentieth-Century Spanish-American Theater
- SP 256. Contemporary Spanish-American Prose

- SP 257. Modern Spanish-American Poetry
- SP 259. Third World Women and Globalization
- SP 261. Facing Facts: Spanish-American Nonfiction
- SP 262. Topics in Spanish-American Literature
- SP 262B. Cuba XXI
- SP 262D. Literature and Culture of the Caribbean

In history
- HIS 203. Economies and Societies of Latin America

In anthropology
- ANT 230. Culture, Class, Race in Latin America

In political science
- PSC 268. Transitions to Democracy

In religion and classics
- REL 234. Cry Freedom: Liberation Theologies

Other courses with approval of the Spanish undergraduate advisor.

STUDENT TEACHING

Concentrators interested in student teaching experience for the purpose of New York State certification should consult with the Margaret Warner Graduate School of Education and Human Development as well as with their advisor.

UPPER-LEVEL WRITING REQUIREMENT

The upper-level writing component of concentrators' programs in MLC focuses on both general (conceptual and theoretical) and specific (national) experiences of research, argumentation, composition, and editing and is satisfied by taking the two departmental core courses (CLT 101 and CLT 389) required of all majors.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

COMPARATIVE LITERATURE

(Many courses in comparative literature are cross-listed from courses in national language areas, and all are taught in English.)

101. Topics in Comparative Literature. An introduction to the study of literature and culture in a comparative and theoretical context. Close critical scrutiny of cultural difference as manifested in a variety of literary texts and cultural phenomena. Topics vary and include Historical and Imaginary Paris; Barcelona and the Cultures of the Mediterranean; Cowboys and Indians; Mexico City, Global Metropolis; Napolean: Image, Myth, History.

114Q. Great Cities: The Shogun's Capital: Edo 1600–1850. Edo (modern Tokyo) began around 1600 as the shogun's administrative center for all Japan. For centuries only a tiny fishing port, Edo quickly became a bustling and picturesque urban center, and by 1750 was the largest city in the world. This course examines Edo as historical, political, urban, social, religious, and artistic artifact, exploring the various forces contributing to the creation and shaping of the city, to discover how people lived in and understood this novel environment. The course is taught in English.

212A. Monsters, Ghosts, and Aliens. This course focuses on the horror genre as popular entertainment in Germany, England, and the United States in the nineteenth and twentieth centuries. Particular attention is paid to the construction of others as monsters (Frankenstein, vampires, devils, aliens, etc). Authors include Shelley, Stoker, Rice, and King. Films include *The Haunting, Alien, The Shining,* and *Silence of the Lambs*. This course is part of the Horror in Literature and Film cluster.

214E. Japanese Animation (Anime). An exploration of Japanese popular culture through the world of anime. Films cover a wide range of subgenres, from Hayao Miyazaki's *The Castle of Cagliostro* to more recent works including Akira (cyberpunk), *Silent Mobius*, and *Neo-Tokyo* (futuristic manga adaptations), *Robot Carnival* (battling robots, androids), *Grave of the Fireflies* (postwar nostalgia). Discussions address issues of landscape (city vs. "furusato"), period, fantasy, gender (male, female, androgyne), racism (self vs. other), cultural anxiety. Screenings are held in tandem with an anime series at the George Eastman House. Class taught in English with additional instuction in Japanese as required for majors.

215A. Russia Goes to the Movies. In Russia, the dawning of the age of movies coincided with the birth of the Soviet state. Ac-

cording to Lenin, the most revolutionary of the arts was also to be the art of the Revolution. Yet Soviet directors, from Eisenstein to Tarkovsky, were also among the world's most influential filmmakers.This class looks at these artistically interesting and popular films while exploring the changing relationship between politics, experimentation, and entertainment in Russian cinema, always mindful of the backdrop of totalitarian society and the nature of mass culture in general. Topics include Innovation and Ideology; From Hollywood to High Stalinism; Popular Patriotism; The Thaw in Cinema after Stalin's Death; From High Hopes to Stagnation (the sixties and seventies); The Last Days of Soviet Film and the New Russian Cinema. No knowledge of Russian required. Attendance at weekly screenings is mandatory.

216C. Women in Hispanic Film. Critics tend to divide the representation of women in Hispanic films into mutually exclusive, confrontational categories such as virgin or whore, maternal or seductive, traditional or modern, icon or fallen idol. This course examines images of women in a variety of films from Latin America and Spain to problematize these artificial divisions and to seek out the ambiguous and conflictual aspects of personal (and national) identity embodied in them. Topics range from the use of "the feminine" in war propaganda (Spain, Cuba, and Central America) to films of the Franco dictatorship, and from Latin American political documentaries to popular commercial films by directors such as Bunuel, Almodovar, Bemberg, Saura, Arau, Leduc, and Novaro. Emphasis is on cinematic representation as visual ideology and on films at the millennium. Class taught in English. Written work in Spanish for SP credit.

222A. Sexuality and Gender: Eighteenth-Century Representations. This course explores eighteenth-century conceptions/constructions of the body, sexuality, and gender as manifest in medical papers, handbooks, aesthetic essays, and literary works to include Lessing's *Laocoon*, Herder's *Pygmalion*, Mor-itz's *On Beauty*, Schiller's *On the Education of Man*, Rousseau's *Julie*, Richardson's *Clarissa*, Goethe's *Natural Daughter*, and Schiller's *Maria Stuart*. Additional theoretical readings include: Foucault, Kristeva, Butler, and G. S. Rousseau.

231B. Madness and Postcolonial Literature. This course explores inscriptions of madness in postcolonial African and Caribbean texts. Beyond the obvious and visible signs of what is generally termed "madness" (from the pathological to the political or cultural), we ask ourselves if the postcolonial arena cannot be interpreted as a pervasive manifestation of madness, that is to say, of something fundamentally "alien, foreign" to the Known, to the imperial destructuring order, and to the disarticulated colonial and postindependent communities. By bringing together texts from different and diverse cultural and intellectual areas such as France, Guadeloupe, and Africa, we seek to confront the various "scriptures." Issues of witch-hunt, of disintegration of Juletane, the Antillean women in West Africa, from Foucault's normative panopticism to Fanon's discussion of the black experience, the postcolonial situation, articulated or silenced, will be the focus of this course. Taught in English. Reading list: Michel Foucault, *Discipline and Punish;* Edouard Glissant, *The Caribbean Discourse;* Frantz Fanon, *Black Skin, White Masks;* Sony Labou Tansi, *The Antipeople;* Maryse Conde, *I, Tituba, Black Witch of Salem;* Myriam Warner-Vieyra, *Juletane;* Henri Lopes, *The Laughing Cry*.

236B. U.S. Latinos/Latinas. This course introduces students to the emergent field of U.S. Latino/Latina writing and culture. Does the rich diversity of Latino communities in the United States—stretching from Los Angeles and the southwest to Miami and New York via Texas, Chicago, Minneapolis, and all stops in between—frustrate or cancel any attempt to group their experiences under a single ethnic-racial term like "Latino/a"? What exactly is "the browning of the Midwest"? To what kind of gender, sexual, and racial codes are the inhabitants of these communities subjected? How do Latino/a narratives map the conflicted terrains of "utopias without borders," free-trade zones, diasporas, nomadic workforces, and even the Internet? To be Latino in the United States is to participate in a unique process of cultural syncretism that some day may become a transformative template for the whole society. We examine two among the many provocative questions for the twenty-first century: (1) What will be the effects of further Latinization of the American urban landscape? and (2) What does "buscando America" mean for different cultural groups and social classes? Readings and discussions include Mike Davis, *Magical Urbanism; Latinos Reinvent the U.S. City;* Junot Diaz, *Drown;* Sandra Cisneros, and texts by Piri Thomas, Julia Alvarez, John Rechy, Ana Castillo *(The Goddess of America)*, Richard Rodriguez *(Days of Obligation)*, Rodolfo Acuna, Helena Maria Viramontes, Gustavo Pérez Firmat, Ilan Stavans, and others. Class taught in English.

265E. Dangerous Texts: Literature and Politics in Russia. When modern Russian literature began to evolve in the mid-1600s, the printed or written text was immediately seen as a potential danger to the power of Church and State. This course examines dangerous texts from the seventeenth century to the present to see what aspects of texts and their authors were seen as threats and how these threats were dealt with. Also explored are the ways in which writers did indeed perceive themselves as a second government and how this changed the way they wrote. The reading list includes works by Avvakum, Radishchev, Pushkin, Lermontov, Gogol, Turgenev, Dostoevsky, Tolstoy, Babel, Mayakovsky, Mandelstam, Pasternak, Yevtushenko, Solzhenitsyn, Voinovich, Grossman, and Sinyavsky/Tertz. The goal of this course is to arrive at an understanding of the unique role played by literature in Russian history. Class taught in English.

281B/481B. Psychoanalysis and Literature. An introduction to the major works of Sigmund Freud and Jacques Lacan, with particular emphasis on their application to literary and cultural studies. No previous familiarity with this material is assumed.

282B/482B. Nietzsche and the Nietzscheans. Friedrich Nietzsche continues to be one of the most influential modern philosophers, yet controversy surrounds almost every aspect of his life and work. This course helps students go beyond the controversy in order to consider Nietzsche's texts discerningly and how he approached the problems of truth, power, and morality. Close examination of his most important writings are com-

plemented by inquiry into Nietsche's effects on twentieth-
century philosophy, literature, and visual culture. Other thinkers include Spengler, Weber,
Heidegger, Foucault, Kofman, Derrida.

CHINESE

101. Elementary Chinese I. Credit—6 hours. Introduction to modern spoken Mandarin. Emphasis is on developing the students' ability to speak and comprehend the most widely used dialect of modern Chinese.

102. Elementary Chinese II. Credit—6 hours. Continuation of CHI 101, and an introduction to elementary readings in Chinese.

151. Intermediate Chinese I. Continuing study of spoken Mandarin and vernacular written materials. Prerequisite: CHI 102 or equivalent.

152. Intermediate Chinese II. Continuation of CHI 151.

202. Advanced Chinese I.

203. Advanced Chinese II.

204. Advanced Conversational Chinese.

210. Introduction to Traditional
Chinese Culture. An overview of important developments in shaping four millennia of Chinese culture from early historical times to 1800, with emphasis on the basic elements of its religious, philosophical, literary, and artistic traditions.

232. Asian Calligraphy. East Asian calligraphy is the oldest continuous writing system in the world, and ranks as an art with poetry and painting. This innovative course joins the two components by offering one class period of writing with a licensed teacher of calligraphy, and one dealing with the history and art of calligraphy each week. Students must attend and are graded on both parts. The course is restricted to those who have completed at least one year of formal Chinese or Japanese language instruction. Enrollment is limited and preference is given to those currently enrolled in Asian language study.

FRENCH

101. Elementary French I. Fundamentals of the grammar, culture, and pronunciation of the language. Emphasis is on developing communication skills, principally speaking but including listening, reading, and writing. (Fall and Spring)

102. Elementary French II. Continues the work of the beginning course. There is an added emphasis on reading comprehension and vocabulary building. (Fall and Spring)

114. Conversational French. Credit—2 hours. Emphasis on speaking skills with focus on current issues in French culture and society. Prerequisite: FR 102 or equivalent. May be taken concurrently with FR 151 or 152. May be taken twice for credit. (Fall and Spring)

151. Intermediate French I. Intermediate-level study of French and French culture. Special emphasis on the geography of France and contemporary French culture and on develop-ment of reading, discussion, and com-position skills. Prerequisite: FR 102 or equivalent. (Fall and Spring)

152. Intermediate French II. Continuation of FR 151 with emphasis on a historical approach to French culture. Continued attention given to reading, discussion, and compositional skills. (Fall and Spring)

155. French Conversation and Composition. The most advanced conversation and composition course aims to bring students to a level of proficiency with the spoken language, including its idiomatic forms, and to refine composition skills. Course materials include extensive use of popular French culture, including film.

157. French in France. An intensive, conversation-grammar review course at the intermediate level. Students stay for a month in the summer with French families in Rennes, learn about French culture, and have opportunities for side trips and tours to places of historical and aesthetic importance. (Higher-level students may register for FR 207.)

158. Francophone Studies. Francophone studies is a four-week summer course in French language and francophone culture given in a native French speaking country. (Higher-level students may register for FR 208.)

159. Paris and Normandy: Sites of Memory. Credit—2 hours. See course 213 for description.

NOTE: FR 200 and 202 are ordinarily prerequisites for all 200-level courses in French literature. Many 200-level courses are cross-listed with CLT and/or film and media studies, visual studies, women's studies.

200. Advanced French. Intensive practice in speaking and writing the language; review of grammar on an advanced level. (Fall and Spring)

202. Introduction to Literature in French. Introduction to and intensive practice in the reading and interpretation of French, including materials from literature, the media, and popular culture.

204. Contemporary French Culture. An introduction to the social structures, institutions, and value systems which make up contemporary French society. Analysis of their manifestations in contemporary political structures and events, philosophy, art, film, the media, etc.

206. French Cultural Traditions. An introduction to pre-twentieth-century French culture. Topics include social, political, philosophical, and artistic movements across a variety of historical periods.

207. French in France. See FR 157.
208. Francophone Studies. See FR 158.
212. A Course in French Translation. Intended for those who have some basis in the language (preferably intermediate level or above), who wish both to improve their comprehension of the written text and to interpret it at an appropriate stylistic level through translation into English. The course is based on a great variety of texts, elementary to highly sophisticated, belletristic to scientific, selected both by the teacher and by the students.
213. Paris and Normandy: Sites of Memory. This course intends to explore the representations of Paris and Normandy (the landing beaches of Normandy) in literary and visual representations. Beyond the cultural riches of Paris and Normandy, this course intends to familiarize students with the complexities of cultural representation. It also seeks to provide students who are considering to study in Paris and Rennes with tools that will prepare them for the complexities of cultural encounters, that will prepare them for the excursions in the landing beaches of Normandy, a highly emotional and historical place where the United States and France meet. This course is strongly recommended for students who plan on taking FR 157/207 (French in France). All other students are welcome. Reading list includes *Les Lettres persanes* (Montesquieu), *Bel ami* (Maupassant), *Le Petit prince de Belleville* (Calixthe Beyala). Films and
videos include *Saving Private Ryan, La Haine, Paris at the Time of Balzac,* and more. Taught in French.
220. The Eighteenth Century Novel. Study of major authors of the French Enlightenment, as well as their predecessors and contemporaries, including Marivaux, Montesquieu, Voltaire, Prévost, Rousseau, Diderot, Sade, and Laclos.
230. The Nineteenth Century Novel. Topics in nineteenth-century French culture, especially those that consider the relations among the various literary genres and between these genres and other disciplines, e.g., visual arts, philosophy, history, music. (Fall)
231. Nineteenth-Century French Novel: Aesthetics and Ideology. Analysis of selected works by major nineteenth-century nov-elists including Balzac, Stendhal, and Flaubert.
233. Realists and Romantics. Nineteenth-century French literature witnessed two competing literary currents; romanticism and realism. Romanticism, heir to the logic and reason of the French Enlightenment, sought to rescue from scientific systematization the wonder and awe of nature; realism attempted to describe the world exactly as it was. This course examines the confrontation of these two movements, and attempts to discern what made each distinct, as well as what features they may unwillingly have shared. Do realistic novels romanticize their subjects? What's true to life
in romantic descriptions of nature? How
do aesthetic concerns become social or political ones? Readings include Constant, Chateaubriand, Flaubert, Rimbaud, Baudelaire, and Maupassant.
240. Le Roman Francais. This course looks at the history of the French novel, from its early history in the late seventeenth century, through the philosophic and great realistic traditions of the eighteenth and nineteenth centuries, and up to and including recent works of fiction. Also students study the form and function of the novel, as well as the narrative structures and forms of verisimilitude that authors chose to develop. Authors include Mme. de Lafayette, Voltaire, Diderot, Flaubert, Robbe-Grillet, and others. Readings and class discussion primarily in French.
243. Mutilated Bodies, Mutilated Discourse. "Transnational sisterhood" or cultural imperialism? Legitimate ritualized practice or outdated violent ritual? Genital cutting, female circumcision, female genital surgery? . . . the controversy over this practice already begins with the act of its naming. Who is qualified to speak the truth about the assaulted female body? How can one explain the fact that Western feminist discourses and right-wing politicians tend to agree on the issue of genital mutilations? If there seems to be a consensus about the physical violence imposed on the female body, why is it that Western feminist discourse is suspected of perpetuating
the mutilation of African voices? This course seeks to provide an understanding of the
context in which a fragmented "transnational
sisterhood" allows for a proliferation of mutilated discourses on mutilated postcolonial (African, poor, and defenseless) bodies. Readings include Alice Walker, Evelyne Accad, Fauziya Kassindja, and critical feminist readings from African, French, and North American authors. In English.
247. Black Paris. This course is a study of Black Paris, as imagined by three generations of black cultural producers from the United States, the Caribbean, and Africa. Paris is as a space of freedom and artistic glory that African-American writers, soldiers, and artists were denied back home. For colonized Africans and Caribbeans, Paris was the birthplace of the Negritude, the ultimate cultural renaissance influenced by the Harlem Renaissance. From Josephine Baker, Richard Wright, James Baldwin to Shay Youngblood's *Black Girl in Paris*, from Aime Cesaire to Maryse Conde, from Bernard Dadie's *An African in Paris* to contemporary Franco-African writing, we investigate how the representation of Paris functions in the construction of black identities. Readings include *Black Girl in Paris* (Shay Youngblood), *Desirada* (Maryse Conde), *The Josephine Baker Story, Paris Noir: African Americans in the City of Light* (Tyler Stovall), *An African in Paris* (Bernard Dadie).
248. Poets and Painters. In this course students study the relationship between French poetry and painting from about 1868 to 1968, primarily focusing on the twentieth century. The course examines literary movements that affected painting and artistic movements that entailed new ways of writing. Through this students can also examine other collaborative arts such as music, dance,

and theater. Poets include Mallarme, Valery, Ponge, Michaux, Char, Jacottet, Apollinaire, and less-known writers. Course and readings primarily in French.

260. The Twentieth Century. Topics in twentieth-century French culture, especially those that consider the relations among the various literary genres and between these genres and other disciplines, e.g., visual arts, philosophy, history, music. (Spring)

261. The Twentieth-Century Novel. A survey of the major literary movements of the twentieth century, with special attention to intellectual and social contexts that engendered them.

261A. The Contemporary French Novel. This course explores the development of the French novel from 1990 to today. Course, readings, and discussion are all in French.

264. Contemporary French Thought. This course is a survey of the major intellectual movements of the twentieth century. Begins with Ferdinand de Saussure and the study of the linguistic sign, then moves on to consider cultural anthropology and the invention of structuralism. Finally, the course takes a detailed look at Derridean deconstruction, the movement that has influenced so much Anglo-American criticism, and concludes with a brief foray into other forms of post-struc-tura-lism.

271. Introduction to Francophone Literature. This course surveys Francophone African and Caribbean literature from its beginnings in the 1940s to the postcolonial age. Study includes major trends and texts that have shaped the emergence of a genuine Francophone literary tradition. Issues of cultural confrontations, exile, panafricanism, diasporic migrations and interactions, race, class, and gender in African and Caribbean postcolonial societies are addressed through a close reading of texts. Movies are used as an integral part of this course and help in the understanding of the concept.

272. Madness and Postcolonial Literature. This course explores inscriptions of madness in postcolonial African and Caribbean texts. Beyond the obvious and visible signs of what is generally termed "madness" (from the pathological to the political or cultural), the course asks if the postcolonial arena can be interpreted as a pervasive manifestation of madness, that is to say, of something fundamentally alien, foreign to the Known, to the imperial destructuring order, and to the disarticulated colonial and postindependent communities.

274. Caribbean Novel and Theory. This course is a study of major Caribbean novels and major theoretical texts. The reading is structured around the notion of "Antillanité" or Creolization elaborated by Martinican Edouard Glissant and his heirs Chamoiseau and Confiant of the "Créolité" movement. The controversial presence of the Other (Africa and France) in the Caribbean, and the need to build a Caribbean authenticity in order to participate freely in what Glisant terms "relation planétaire" (planetary relations) is also thoroughly examined.

275. Freud, Lacan, and Contemporary French Thought. Study of the intersection of psychoanalytic, linguistic, and narratological theories of representation.

276. Contemporary Women's Writing and French Feminism. This course primarily deals with contemporary novelists and critics whose work focuses on gender and identity construction in a French//Francophone context. The course studies the changes in French feminism and women's writing since 1968. A major focus of the course is the changing political and social role of women writing in French and how these voices differ from those of previous eras. Primary texts include works by Cixous, Kristeva, Ndiate, Redonnet, Yourcenar, Wittig, and Le. Readings and discussion are in French.

277. Poststructuralism to Post-moder-nism. This course is designed to offer a critical examination of the major developments in French theory from post-structura-l-ism to postmodernism. The course is organ-ized around close readings of selected essays by authors whose work has had a powerful impact within the development of French thought and in the United States. Our readings focus on the relation of philosophy and critical theory to literature, history, politics, and power.

278. African Novel: Its Theory and Its Contexts. This course is a study of the Francophone African novel from north sub-Saharan Africa and from Madagascar. The course explores the political and cultural contexts that gave rise to the modern African literature in general, and to the modern African novel in particular.

280. French Film: The New Wave. A study of French film from its beginnings through the New Wave.

281. History of French Film. This course surveys the history of French cinema from its early experiments through the "Tradition of quality" to the moment immediately preceding the emergence of the New Wave. Films selected from the work of the following directors are studied: Lumiére, Méliés, Gance, Dulac, Léger, Clair, Vigo, Renoir, Carné, Ophulus, Pagnol, Clément, and Bresson. Readings include contemporary critical and theoretical discussions, as well as historical analyses.

283. Contemporary French Film. Through close analysis of popular film, this course explores contemporary French culture as it reworks national identity. Focusing on changing definitions of "Frenchness," the course examines its articulations with shifting conceptions of tradition, of the popular, and of the nation. Readings include central cultural conflicts around identity and difference in the context of the emergent European economic community, as well as the specifically French context of "immigration" and "assimilation."

389. Major Seminar.

391. Independent Study. Study of special linguistic or literary problems under the direction of a member of the faculty.

393. Senior Essay. A paper based on independent study: may be written by concentrators. Students should normally register for this course in the fall term of their senior year.

GERMAN

101. Elementary German I. Introduction to the structure of modern German and its basic vocabulary. Training in speaking, comprehension, reading, and writing through classroom instruction and recitation periods. (Fall)
102. Elementary German II. Continuation of GER 101. (Spring)
114. Conversational German. Emphasis on speaking skills with focus on current issues in German culture and society. Prerequisite: GER 102 or equivalent. May be taken concurrently with GER 151 or 152 may also be taken twice for credit. (Fall and Spring)
151. Intermediate German I. Focus on modern German culture and civilization. Special attention to grammar review, vocabulary, and reading skills. Prerequisite: GER 102 or equivalent. (Fall)
152. Intermediate German II. Continuation of GER 151 with ongoing grammatical review and increasing attention to conversation and composition. Prepares students for international "Zertifikat Deutsch als Fremd-sprache" exam. (Spring)
157. German in Germany. Credit—6 hours (based on evaluation). An intensive program offered in German at all levels in Berlin, Germany, for one month in summer. Instruction by native Germans with University of Rochester faculty member in residence. Includes side trips and excursions in this historic area. Higher-level students may register for GER 207.

NOTE: GER 200 and 202 or their equivalents are normally prerequisites for all 200-level courses in German. Many 200-level courses are cross-listed with CLT and/or film and media studies, visual studies, women's -studies.
200. Advanced German. Readings on current issues. Objectives include enabling students to converse freely in German on a variety of topics and the review of grammar on an advanced level with particular attention given to writing style and idiomatic German.
202. Introduction to German Studies. This is one of several core classes required for the major. Students should have completed at least GER 152 and preferably GER 200. This course introduces students to basic principles of cultural analysis at the heart of the discipline of German studies. Emphasis focuses on how the media act to form and facilitate various aspects of issues in contemporary German culture.
203. Introduction to German Literature. Introduction to the interpretation of German literary texts with emphasis on the terms and techniques of analysis. (Fall)
204. Marx and Marxism. Who was this person, Karl Marx? Why is it that in this post–Cold War world his writings continue both to inspire and threaten contemporary readers? How have those inspired by Marx further developed his ideas to constitute the discourse of Marxism? The course begins with discussions of key works by Marx, then moves on to examine some significant contributions to Marxism.
205. Nietzsche and the Nietzscheans. Following chronological lines, a systematic introduction to Nietzsche's writings, especially regarding the females and the feminine. The course does not focus on any particular aspect of Nietzsche, but attempts to cover the fundamental problems of Nietzschean philosophy.
206. Freud and Psychoanalysis. Freud is one of the most influential thinkers of the twentieth century. His groundbreaking work on dreams, the Oedipus Complex, and psychoanalytic methods have profoundly changed our understanding of the psyche and social interaction. This course provides a basic survey of Freud's most important and often controversial writings/discoveries within their historical context and with regard to significant criticisms of his work. "Freud: An Introduction" is part of a cluster which includes courses on Marx and Niet-zsche. (These courses need not be taken in any particular order.)
207. German in Germany. See GER 157.
209. The German Play. Close background study, interpretation, and performance of a German play, chosen from a group of readings selected according to interests, ability, and composition of the class. (Spring)
212. Monsters, Ghosts, and Aliens: From Schiller to Stephen King. This course focuses on the horror genre as popular entertainment in Germany, England, and the United States in the nineteenth and twentieth centuries. Particular attention is paid to the construction of others as monsters, ghosts, and aliens. Authors include: Schiller, Tieck, Hoffmann, Goethe, Droste-Huelshoff, Meyer, Shelley, Bradbury, Rice, and King.
220. Sexuality and Gender: Eighteenth-Century Representations. This course explores eighteenth-century conceptions/constructions of the body, sexuality, and gender as manifest in medical papers, handbooks, aesthetic essays, and literary works.
229. Kleist and Kafka. This course emphasizes the short prose of Kafka and Kleist, who provide literary representations of modern bureaucratic nightmares, of contemporary obsessions with the blurred boundaries between reality and fantasy, ailing artists, suffering male bodies, nonexistent or idolized women, guilt, and existential angst.
230. Poe and Hoffman: Uncanny Stories. This course focuses on the mysteries, horror stories, and "strange" short fiction of Poe and Hoffman. Students investigate generic and narrative structures as well as the vivid fantasies, dreams, visions, and psychological studies portrayed in the short stories of these two authors.
245. The Weimar Republic: Literature, Art, and Politics: 1918–1933. Focuses on relations between art and politics with special attention to Berlin as a cultural and intellectual center.
268. The Essential Goethe. Focuses on Goethe's major achievements as a poet, literary critic, natural scientist, and statesman in Weimar.

272. Gender and Sexuality in the Twentieth Century. This course examines literary, artistic, and theoretical representations of gender and sexuality as they have changed in the course of the twentieth century. From the New Woman to French Feminists and transnational feminism, from homophile societies to "queer nation" and gay marriage, from Sigmund Freud to Michel Foucault and Judith Butler, the course explores the contested and politically charged debates around gender and sexuality that have shaped our views of identity over the last century.

283. Cinema and Revolution: The West German Avant-Garde. Dissent, violence, terror. This course explores the relationship between film and revolution in West German cinema from 1965 to the present. The course considers cinema's potential as a revolutionary medium, while also focusing on how revolution is thematized and constructed in both fiction and documentary films. The course engages issues such as coming to terms with the fascist past, recreating the cinema as a revolutionary artistic form, feminism as a revolutionary perspective, the domestic sphere as a revolutionary space, and the co-optation of the cinema's revolutionary potential through mass consumption. Each film is explored in relation to its sociohistorical context, providing students with an overview of German film and culture of the period.

284. Hollywood Behind the Wall: Intro into East German Cinema. The East German film studio, DEFA, was the second largest studio system in the former Eastern bloc, and produced more than 650 films between the years 1946 and 1990. This course explores major developments in the East German cinema during the four decades of its existence. The course engages issues such as coming to terms with the fascist past, popular filmmaking and art cinema, cinema as a pedagogical tool, artistic dissent and state censorship, socialist ideologies of gender, and the politics of documentary. Each film is explored in relation to its sociohistorical context, providing students with an overview of East German film and culture. This course coincides with the University of Rochester's fall film event, which features select films from East Germany, as well as guest appearances by East German film historian, Ralf Schenk, and director, Egon Günther.

285. New German Cinema. Study of major directors and films.

287. Nazi Culture. This course uses the films of the Third Reich to examine the parameters of Nazi culture. It examines such diverse aspects as the Leader Principle, gender roles, racial hygiene, anti-Semitism, mass culture, propaganda, and visions of history. Films are analyzed both in terms of their aesthetics as well as the social and historical context of their production.

288. New German Cinema: From National to Transnational Productions. This class examines the aesthetic and technical aspects of German cinema as well as the historical and social context of its production. It explores the relationship between film, society, and culture. In examining the themes and forms of various filmmakers, students become acquainted with the issues and ways of seeing that have occupied the German public since 1945. As students hone their skills of cultural analysis and critique, they also gain insight into the general conditions of film production.

391. Independent Study in German.

393. Senior Essay. A paper based upon independent study; may be written by concentrators, preferably in the fall term of their senior year.

399. Practicum in German. Investigation of special topics in German language, literature, or linguistics.

ITALIAN

101. Elementary Italian I. An introductory study of the structure of the Italian language with equal emphasis on speaking, reading, and writing skills. (Fall)

102. Elementary Italian II. A continuation of IT 101. (Spring)

111. Elementary Italian. The course offers an introduction to basic grammar with intensive training in speaking, listening, reading, and writing. It also guides students in the process of observation, experimentation, and discovery of the culture on the local level. (Spring: Arezzo, Italy)

114. Conversational Italian. This conversation course is designed to help students with some previous knowledge of Italian grammar develop facility with the spoken language. Emphasis is on vocabulary-building. Classes include debate, discussions, and conversations about current topics and aspects of contemporary Italian culture. Recommended in conjunction with any Italian course, except IT 101, for extra practice. May be taken twice. (Fall and Spring)

124. Italian Culture. The course aims at presenting various aspects of contemporary Italian culture to students with no previous knowledge of the Italian language.

151. Intermediate Italian I. Continuing study of modern Italian geared to enhance speaking, reading, and writing skills. Emphasis on grammar. Readings and discussions on topics of Italian history. (Fall)

152. Intermediate Italian II. Continuation of IT 151. Readings and discussions on topics of Italian geography and economy. (Spring)

153. Accelerated Italian. The course is equally focused on language skills and cultural awareness. While working on speaking, listening, reading, and writing, students research, experience, and then analyze various aspects of contemporary Italian culture. Daily newspapers and current magazines are among the course reading materials. (Spring: Arezzo, Italy)

154. Intermediate Italian II. Credit—6 hours. Prerequisite: IT 151. (Spring: Arezzo, Italy)

157. Italian in Italy. Credit–6 hours. The course presupposes full immersion in Italian language, culture, and lifestyle. Emphasis on communication skills, both oral and written, and on constant language practice in concrete, everyday situations. Visits to muse-

ums and excursions to various places of artistic and historic relevance constitute material for discussion and practice. (Summer: Padua, Italy)

159. Roman Structures: Engineering in the Classical World. This is an introductory course with no prerequisites and not calculus based. It begins with an intensive summer fieldwork in Rome and it consists of a study of Roman engineering focused primarily on civil engineering structures, and also including
topics in mechanics, hydraulics, and materials. Modern theories in structural mechanics and strength of materials are used to analyze the practice, the achievements, and the limitations of Roman engineering.

190Q. Italian Regions: From Geography to History, from Language to Culture. While exploring the geographical and political configuration of the Italian territory, the course focuses on the Italian regions as discrete entities with their own historical, economic, linguistic, and cultural characteristics and on the multiple aspects of their urban and non-urban civilization. Among the topics of investigaion are art, literature, and film; social, economic, and religious life; dialects; high cultural traditions and popular ones. Class taught in English, although students with basic knowledge of Italian have ample opportunity to practice and enhance their linguistics skills.

195Q. *Divine Comedy* I: *Inferno* and *Purgatory*. This course is the first segment of a two-semester sequence on the *Divine Comedy*. The purpose of the sequence is to introduce students to the liberal arts through one of the most significant texts in Western civilization. While reading about Dante's adventurous journey from *Inferno* to *Paradise*, students gain a perspective on the Biblical, Christian, and classical traditions, and on the political, literary, philosophical, and theological dimensions of medieval European culture. The sequence also provides students with an avenue of investigation on the problem of knowledge—one of the poem's central concerns—and guides them in developing critical tools and research skills. Continuation of Dante's *Divine Comedy* II is recommended but not required.

196Q. Dante's *Divine Comedy* II: *Purgatory and Paradise*. This course is the second segment of a two-semester sequence on the *Divine Comedy*. See description for IT 195Q.

200A, B. Italian Culture and Advanced Italian Language. Designed for students who already have a basic knowledge of spoken and written Italian, this course addresses different aspects of contemporary Italian culture. Two thirds of the course is taught in English and one third in Italian. Readings are divided accordingly between the two languages. Topics may include politics, economics, mass media, intellectual life, education, and popular culture. (Fall)

208. Advanced Tutorial in Italian. The course is designed for advanced students. It involves class practice and independent pro--jects. (Spring: Arezzo, Italy)

222. Boccaccio's *Decameron*. This course offers a close reading of a selection of stories from the *Decameron* geared towards understanding Boccaccio's sense of the aesthetic experience and its cognitive value. Emphasis is on literary traditions, which the text absorbs and manipulates, and the medieval intellectual debates in which it engages.

223. Italian Trecento. Readings from Dante, Boccaccio, and Petrarch in the cultural context of thirteenth- and fourteenth-century Europe.

228. Italy from the Risorgimento to the Republic: 1815–1948. After a two-week introduction to contemporary Italian society, national and local political institutions, geography, and the historical development of the Italian peninsula from the fall of the Roman Empire to the French Revolution, the course takes a multidisciplinary approach to the study of united Italy's politcal, social, and cultural history, through the adoption of the anti-fascist constitution of 1948. (Spring: Arezzo, Italy)

230. Italian Cities and Their Civilization. The course addresses aspects of the history, literature, art, politics, music, and folklore of a few major Italian cities such as Siena, Florence, Pisa, Rome, Naples, Palermo, Verona, and Venice.

244. Tuscan Painting and Social Change: 1300–1450. The course examines works of art as they might have been seen by learning how to read and interpret the complex elements at play beneath the immediate surface appearance of paintings and by exploring the universal unspoken language of signs and symbols used by artists. (Spring: Arezzo, Italy)

247. Modern Italy: From Renaissance to Unification. The objective of the course is to analyze the major intellectual and cultural phenomena that took place in Italy from the fifteenth to the nineteenth century, and the extraordinary impact that such phenomena had in the course of Western civilization. Readings include Boccaccio, Petrarch, Machiavelli, Castiglione, Ariosto, Tasso, Galileo, and Vico. The course consists of lectures and group discussions.

276. A Cultural Mosaic in an Intercultural Context. The course consists of four units taught sesquentially by visiting faculty. Classroom instruction is enhanced by field trips. (Spring: Arezzo, Italy)

JAPANESE

101. Elementary Japanese I. Credit—6 hours. Introduction to colloquial Japanese, with emphasis on developing speaking and comprehension skills. The writing system also is introduced for reading simple texts. (Fall)

102. Elementary Japanese II. Credit—6 hours. Continuation of JPN 101. (Spring)

104. Elementary Conversational Japanese. Emphasis on speaking skills with focus on current issues in Japanese culture and society. Prerequisite: JPN 102 or equivalent. May be taken concurrently with JPN 105 or 106. May be taken twice for credit. (Fall and Spring)

151. Intermediate Japanese I. Credit—6 hours. Continuing study of colloquial Japanese through conversation practice and more

intensive development of reading skills. Prerequisite: JPN 102 or equivalent. (Fall)

152. Intermediate Japanese II. Credit—6 hours. Continuation of JPN 151. (Spring)

190Q. Kyoto and Tokyo. This course examines the various forces that shaped Kyoto and Tokyo from the point of view of history, urban studies, religion, art, and literature.

202. Advanced Intermediate Japanese I. This course aims at a rapid improvement of students' overall proficiency in the Japanese language. Listening and speaking skills are improved through assignments based upon audio tapes and videotapes, discussion, and role playing in Japanese. Prerequisite: JPN 106 or equivalent. (Fall)

203. Advanced Intermediate Japanese II. Continuation of JPN 202. Essays on Japanese literature and history. (Spring)

204. Advanced Conversational Japanese. Provides students of JPN 202-level or higher with the opportunity to improve their speaking skills. Class activities include grammatical oral drills (this is not a lecture course on the grammatical aspects of Japanese) and discussion of current issues. The class is conducted in Japanese, and might not benefit students who have already acquired near-native fluency. Prerequisite: JPN 152 or instructor's permission. (Spring)

NOTE: Many courses above 204 are cross-listed with CLT and/or art and art history, film and media studies, women's studies, history, religion and classics.

210. Introduction to Traditional Japanese Culture. Traces the development of the Japanese cultural tradition through the most prominent examples of its visual, literary, and performing arts. These include the poetry, courtly romances and scroll painting of the ancient courtiers; the poetry, Noh drama, and ink painting of the medieval samurai and Zen monks; the haiku poetry and art of early modern literati groups; and the poetry, kabuki theater, and print art of the new urban classes. Also examined are architecture, flower arranging, and the artistic complex of the tea ceremony. Emphasis is given to the social contexts of artistic expression.

217. *The Tale of Genji*. One of the greatest works of world literature, a huge and sprawling psychological novel of Japanese court life, love, and intrigue in tenth- and
eleventh-century Japan.

219. Cartoon Connections: Manga and Anime. An exploration of Japanese popular culture as portrayed by the cartoon culture of manga (graphic novels) and anime (Japanese Animation). Material ranges from the origins of print and moving picture cartoon culture in the early twentieth century to the present. Issues addressed include national identity, global consumption, and genre cross-fertilization, providing an opportunity to explore how Japanese culture informs these now widely popular forms of popular entertainment.

220. The Culture of Urban Japan,
1650–1850. This course examines the spectacular urban culture of the Edo period against the background of new economic, political, and legal developments. Of special interest is the world of theaters and entertainment quarters that both reflected and supported the art and literature created by new constellations of social groups.

222. Noh Drama. In Western terms, Noh drama combines elements of classic Greek and medieval European drama with dance, music, and Christian rituals of confession, salvation, and redemption. As a dramatic form, Noh appropriates and integrates myth and legend, religious stories, historical chronicles, family histories, imperial lineages, and the institutionalized power of salvationary Buddhism. (Spring)

223. The Kabuki Theater. An introduction to the techniques, actors, and repertory of one of the world's most brilliant theatrical traditions. Readings in translation and screenings include many of the greatest works of the classical kabuki stage.

232. Asian Calligraphy. East Asian calligraphy is the oldest continuous writing system in the world, and ranks as an art with poetry and painting. This innovative course joins the two components by offering one class period of writing with a licensed teacher of calligraphy, and one dealing with the history and art of calligraphy each week. Students must attend and are graded on both parts. The course is restricted to those who have completed at least one year of formal Chinese or Japanese language instruction. Enrollment is limited and preference will be given to those currently enrolled in Asian language study.

233. The Culture of Zen. Buddhism was the most important element shaping the culture of medieval Japan. This course examines the doctrines and the monastic and worldly practices of Zen Buddhism as they shaped the daily life, literature and drama, art and architecture, calligraphy, interior decoration, and tea ceremony of the period.

234. Haiku Poetry. Haiku poetry and its related art form, haiga ink-painting, were among the most important of the poetic and artistic genres of early-modern (1600–1900) Japan. This course studies the works of the great haiku masters Basho, Buson, Issa, and Shiki.

240. Masterpieces of Traditional Japanese Literature.

246. Contemporary Japanese Culture. The recent Japanese literary and cultural scene, with novels by Murakami Haruki (*Norwegian Wood*) and Yoshimoto Banana (*Kitchen*); films by Itami Juzo (*Tampopo*) and Morita Yoshimitsu (*The Family Game*); manga from Tezuka Osamu (*Phoenix*) and Ikeda Riyoko (*The Rose of Versailles*) to the present, and anime from Otomo Katsuhiro (*Akira*) on; and recent views of Japanese culture from at home and abroad. Other areas of interest include women's and gay literature, "business novels," and an examination of the role of the media in today's consumer culture.

254. Modernism and Japanese Literature. Examines Japan's experience of modernity through the major novels of the period 1900–1970. Includes works by Natsume Sôseki, Mori Ogai, Tanizaki Jun'ichirô, Kawa-bata Yasunari, Abe Kôbô, Mishima Yukio, Oe Kenzaburô, and Kaikô Takeshi.

255. The Novels of Murakami Haruki. The works of Japan's best-known contemporary writer, including *Norwegian Wood, A Wild Sheep Chase, Pinball 1973, Hard-Boiled Wonderland and the End of the World, The Windup Bird Chronicle,* and short stories.
261. Kyoto. Credit—2 hours. This course examines the various forces that shaped Kyoto from the point of view of history, urban studies, religion, and art.
262. Tokyo. Credit—2 hours. This course examines the various forces that shaped Tokyo from the point of view of history, urban studies, religion, and art.
273. Japanese Women Writers. A critical and historical introduction to the works of Japanese women writers in a variety of genres from the early twentieth century to the present. Special focus is given to the major trends in the emergence of a women's literary tradition, contemporary feminist issues, and the social, cultural, and ideological context (including issues of class, generation, sexuality, and nationalism) for women's writing in Japan. Writers and works include Higuhi Ichiyo ("The Thirteenth Night"), Uno Chiyo (*Confessions of Love*), Enchi Fumiko (*The Waiting Years*), Tsushima Yuko (*A Child of Fortune*), and Yamada Eimi ("Kneel Down and Lick My Feet").
283. History of Japanese Cinema. A survey of Japanese cinema since its origins, this course examines the major issues, trends, and moments that make up its history. Content varies according to the particular timespan offered (origins to 1960s or origins to present), but significant topics addressed include silent film and popular culture; the import market and its influence; prewar, wartime, and postwar censorship; popular genres; animation; the early international festival circuit; the art film and New Wave; and patterns of global distribution and exchange. Course taught in English (additional instruction in Japanese available for majors).
284. Mobsters, Monsters, Swords. This course explores the origin and definition of (and relations between) a selection of genres, popular with both domestic and international audiences, that are commonly identified as synonymous with Japanese cinema. Examples include the chambara swordfight film (*Seven Samurai*), science fiction (*Godzilla*), the gangster film (the work of Seijun Suzuki), and animation. Also considered are issues of genre variation and transformation and, in some cases, resilience and perpetuity. Students are responsible for assigned readings and are required to attend screenings. Previous coursework in Japanese and/or film studies (theory, history, and analysis) is useful but not required.
285. Director: Akira Kurosawa. An intensive study of the films of Akira Kurosawa, whose work has so strongly informed the profile of Japanese cinema worldwide. Thanks to his prolific output, an analysis of his 50-year career until his death in 1998 offers the opportunity to examine many of the major cultural, political, and social issues and events that have left an imprint on the theory and production of film in Japan.
286. The Japanese New Wave. Novice -studio and independent filmmakers altered the profile of Japanese cinema during the 50s and 60s. Paralleling the theoretical and pragmatic work of the French New Wave, they advocated filmmaking that would defy the -status quo witha new political and social self-consciousness. This course studies the work of individuals (Oshima, Imamura, Teshingahara, and others) active in or associated with the Japanese New Wave.
287. Nagisa Oshima: Rebel Film. An intensive study of the work of Nagisa Oshima, who jump-started the 1960s Japanese New Wave. Influenced by the economic and political tensions of the 50s and 60s, Oshima's early work as a writer/filmmaker "reframed" Japanese cinema so that independent filmmaking eclipsed the industrial status quo. After the death of Akira Kurosawa, Oshima is the last of the prominent film personalities acknowledged internationally in the post-postwar period to breach the millennium.
288. Director: Yasujiro Ozu. An intensive study of the work of Yasujiro Ozu (1903–1963), who defined the most enduring narrative genre in Japan's visual media, the "home drama." This course questions the myth as well as the historical reality of Ozu's career. Why is he labeled "the most Japanese" of Japanese directors, and what does this mean? What do we make of the career of a stylistic "modernist" who transitions from gag comedy, gangsters, and social melodrama to nostalgia and family relations? How do Ozu films interface with the culture and society of twentieth-century Japan?
290. Women in Contemporary Japanese Film. Explores the representation of women in contemporary Japanese film. Begins with a sample of the prototype heroines (predominant in the films of Mizoguchi, Naruse, Ozu) who set the standard for what some Japanese critics describe as a "special Japanese brand of feminism," which they call "the worship of womanhood." Also examines genres based on gender-role archetypes and adaptations of women's literature.
292. Japanese Animation (Anime). A study of anime as film form and cultural phenomenon. Course content varies, from a survey of the range of anime genres to the world views and visual sensibilities of specific directors like Hayao Miyazaki and Mamoru Oshii. Detailed analyses reveal the range and possibilities of anime and its place in popular culture on a local and global scale. This course examines the "nuts and bolts" of animated cinematic construction (use of narrative space, character design, etc.); methods of adaptation, influence, and genre variation; anime reception and fan culture; and issues of race, gender, landscape, genre, identity, and cultural conscience.
392. Practicum in Japanese.
393. Senior Essay. A paper based upon independent study; required of concentrators.

POLISH
101. Elementary Polish I. The main objective of the Elementary Polish course for beginners is to provide the basic uses of Polish syntax, the cases, and prepositions as well as the word-formative process. Polish grammar is presented as an integral part of the basic textbook. Two consecutive semesters of Elementary Polish will include sounds and spellings and relationships between sounds and

inflection as well as basic knowledge of Polish nouns, pronouns, adjectives, numbers, and verbs.
102. Elementary Polish II. A continuation of POL 101, and a prerequisite for Intermediate Polish.
103. Polish Review. Builds on basic -speaking and conversation skills learned in introductory-level Polish courses taken at the University of Rochester or at study abroad -programs.
151. Intermediate Polish. While the main focus of the Elementary Polish course is the word-formative process, the basic use of the cases and prepositions as well as the essential aspects of Polish syntax, the intermediate course focuses on active use of contemporary Polish, written and colloquial. The main objective, based on basic knowledge of grammatical rules is to achieve independence in communication. Summer courses of the Polish language in Krakow, facilitated by the Skalny Center for Polish and Central European Studies at the University of Rochester, are highly recommended after completion of the intermediate course.

RUSSIAN
101. Elementary Russian I. An introduction to Russian grammar, phonetics, and conversation. Emphasis is on practical Russian language skills. (Fall)
102. Elementary Russian II. Completes the introduction to Russian grammar, phonetics, and conversation begun in RUS 101. Students also view and discuss video clips in Russian. (Spring)
114. Russian Conversation. Students cover various topics aimed at improving conversational skills in everyday situations. Prerequisite: RUS 152 or permission of instructor.
123. Russian Life. The culture and history of everyday life in Russia.
124. Background Studies in Russian. Taught by a native speaker of Russian, this course is intended for those with a minimum of one year of college-level Russian. It is struc-tured around Russian film and TV broadcasts and other authentic Russian-language materials. It offers students the chance to im-prove their comprehension and speaking skills. Those taking the course for 4 credits also work on additional written assignments in consultation with the instructor. Class taught in English.
126. Russia Now. In this expanded 4-credit version of the 2-credit Russia Now course, students examine the background to post-Communist Russia.
127. Russia Now. Credits—2 hours. Students follow current events in Russia through the Internet, newspapers, magazines, and other sources. This course is designed to
(1) familiarize students with the most important issues facing Russia today and the historical/political/cultural context in which to place them; (2) to acquaint students with a variety of resources from the United States, Russia, and a number of other countries and the different perspectives these may give on the same issues. Class taught in English.

NOTE: RUS 200, 202, 204, 207, 208, 209, and 212 are advanced language courses. All other courses listed below are taught in English, and readings are in translation.
128. Russian Civilization. Russian civilization from its beginnings a thousand years ago to the present day. Each unit covers historical and cultural background as well as literary texts. National "myths" that govern the Russians' understanding of their history and culture are examined. Traditional tensions in Russian civilization which prevail today, such as those between chaos and order, foreign influence and a strong national identity, innovation and tradition, and between radical skepticism and faith, are analyzed. Readings include Russian fairy tales and saints' lives, excerpts from the autobiography of the seventeenth-century heretic Avvakum, tales by Pushkin and Gogol, one of Dostoevsky's most powerful and influential novels (*Devils: The Possessed*), and a wide range of materials from the twentieth century.
129. Russian Culture. A series of lectures, films, excursions, and field trips designed to acquaint students with contemporary Russian culture and political issues. Held in St. Petersburg. (Summer)
151. Intermediate Russian I. Emphasis on reading, writing, conversation, and further development of grammatical concepts introduced in first-year Russian. The building of vocabulary and comprehension skills is also stressed. (Fall)
152. Intermediate Russian II. Continuation of RUS 151. Grammatical review and increasing attention to conversation and composition. (Spring)
157. Russian in Russia. Russian in St. Petersburg. An intensive, conversation-
grammar review course at the intermediate to advanced level held at the University of St. Petersburg. (Summer)
190Q/235. Tolstoy's *War and Peace* as Novel, History, and Film. A semester-long exploration of the world of *War and Peace*. The class works its way through the novel (in English) over the term, while looking at materials that help "unpack" it, including historical accounts of the same events and attempts by Russian, English, and American directors to capture the essence of the novel on film.
200. Advanced Russian. Advanced work in reading, writing, grammar, and conversation. Analysis of the structure of the Russian language.
202. Advanced Readings in Russian. Students read, discuss, and write about a selection of Russian texts, poetry, and prose of various periods. (Spring)
204. Conversational Russian. For students who have completed at least two years of Russian.
207. Advanced Russian in St. Petersburg. For students who have completed at least two years of Russian.

209. Topics in Advanced Russian Grammar and Syntax. Intensive work in various topics in Russian grammar and syntax at the advanced level with emphasis on practical applications.
212. Advanced Literature and Culture in Original. This course is designed for students who can read Russian at an advanced level and wish to pursue particular areas of interest. Students meet individually each week and periodically as a group, and write essays in Russian on their area of interest.
224. Russian Art. This course focuses on the history of Russian art and architecture from the Christianization of Russia through the twentieth century. Students learn how to read icons, discern the major features of Russian churches, and follow the development of Russian painting from the age of realism to modern times. The course is taught with reference to the major events in Russian history. No knowledge of Russian is required.
231. Great Russian Writers. A survey of the works by Russia's greatest writers of the nineteenth century. Readings include Pushkin's novel in verse *Eugene Onegin*, Ler-mon-tov's *Hero of Our Time*, Gogol's comic narrative *Dead Souls*, Goncharov's *Oblomov* (about a man who cannot get out of bed), short works by Dostoevsky and Tolstoy, and a play by Anton Chekhov. Each work is examined within the context of Russian literary and cultural history, paying particular attention to questions of structure and theme.
237. Dostoevsky. A variety of works are read, culminating in Dostoevsky's last and greatest novel, *The Brothers Karamazov*.
240. Topics in Nineteenth-Century Russian Literature and Culture. Undergraduate seminar.
243. Chekhov and His Contemporaries. The climax of Russian civic, lyric, and psychological realism in the works of Chekhov, Tolstoy, Bunin, Gorky, and others. Symbolism as a reaction to realism and as the beginning of literary modernism in Russia.
246. The Image of Christ in Russian Literature. The image of Christ has dominated Russian art and culture for a thousand years. Indeed, it may even be argued that Russian literature began with Jesus Christ, for in its earliest forms—the numerous accounts written of saints' lives—it dealt with little else than living in accordance with the words and deeds of Christ. After briefly setting the context, the course focuses on the nineteenth and twentieth centuries, exploring the extraordinary range of poetic encounters with the figure of Jesus in works by Tolstoy, Dotoevsky, Aleksandr Blok, Anna Akhmatova, Mikhail Bulgakov, Boris Pasternak, and Venedikt Erofeev.
247. Secret Nation. The cult and culture of secrecy in Russia from Ivan the Terrible to the present. This course uses materials from a variety of disciplines to give a broad yet richly detailed picture of the information that was hidden, and the means by which this was accomplished. The official secrecy that was a defensive strategy came to undermine the state it sought to protect. The semester ends by examining the legacy of secrecy in post-Soviet Russia.
248. Politics of Identity. Competing identities in the Russian Empire, the U.S.S.R., and post–Soviet Russia. Includes Dostoevsky, Babel, Mandelstam, Tertz, and Rasputin.
250. Topics in Twentieth-Century Russian Literature and Culture. Undergraduate seminar.
264. Writers in Exile: Russian Literature Outside of Russia. Some of the greatest literature by Russian writers of the twentieth century was written outside of Russia, sometimes not even in Russian. It was written by writers who fled abroad after the October Revolution in Russia in 1917 or who were later expelled by the Soviet authorities. This literature—banned in the Soviet Union until a few years before its collapse—constitutes a unique body of fiction that exists on the border between two cultures: that of the writers' abandoned Russian homeland and that of their adopted home country. This course provides a survey of the most prominent authors and works of this literature in exile.
265. Russian Literature Between the Revolutions: 1917–1991. The fall of the Soviet Union in 1991 not only marked the end of a social(ist) experiment, but it also closed a period in Russian cultural history. This course looks at the best Russian fiction of the Soviet period, including utopian and anti-utopian works, fantastic satire, prison camp literature, village prose, urban prose, and the "chernukha" (sensationalist art) of the immediate post-Soviet period.
267. Russia Goes to the Movies. The dawn of the age of movies coincided with the Russian Revolution, and film was Lenin's favorite art form. The course surveys Russian film from the beginnings to the present. The course investigates the major role that cinema played in shaping the national and political identity of the Soviet Union, and looks at what was artistically interesting and popular about these films, some of whose directors, like Eisenstein and Tarkovsky, are among the world's most influential filmmakers.
289. Dangerous Texts: Literature and Politics in Russia. The course examines "dangerous texts" from the seventeenth century to the present to see how texts and authors were seen as threats to the state and explores ways in which writers perceived themselves as a "second government" and how this affected their writing. Readings include Avvakum, Radishchev, Pushkin, Turgenev, Dostoevsky, Mandelstam, Solzhenitsyn, Voinovich, and Sinyavsky/Tertz.
391. Independent Study.
393. Senior Essay. A paper based upon independent study; required of concentrators.

SPANISH
101. Elementary Spanish I. Intended for students with no background in Spanish, or whose background does not make placement in a higher-level course advisable. Training in speaking, comprehension, reading, and writing through classroom instruction and recitation periods. Students must also register for an associated recitation section. (Fall and Spring)
102. Elementary Spanish II. SP 102 continues the work of the beginning course SP 101. There is added emphasis on reading

comprehension, vocabulary building, and culture. Students must also register for an associated recitation session. (Fall and Spring)

151. Intermediate Spanish I. Continuing study of modern Spanish in its spoken and written forms. Emphasis is given to cultural and literary readings and discussions, as well as basic composition writing skills and Multimedia Center activities related to the text. (Fall and Spring)

152. Intermediate Spanish II. Continuation of SP 151. Intended to advance conversational skills and refine writing techniques through cultural and literary readings, discussions, and Multimedia Center assignments related to the text.

157. Spanish in Mexico. Study Spanish conversation and culture in Mexico. Program fee includes instruction at Cultural Institute of Oaxaca, family stay and partial board, interviews with and demonstrations by local artisans, some excursions. (Summer)

200. Advanced Spanish Composition. This course is designed to refine the student's writing and reading skills in Spanish in preparation for entering upper-level Spanish courses. The class time and the assignments are divided between developing composition-writing skills, a variety of readings in Hispanic literature and culture, and some review of targeted grammatical structures. Class taught in Spanish. (Fall and Spring)

NOTE: *SP 202, 203, and 204 are offered in this order in successive semesters. SP 200 is a prerequisite to* ***all courses.***

202. Intro to Modern Spanish Literature. Introduction to key works of nineteenth- and twentieth-century Spanish literature, including short fiction, theater, and poetry. Emphasis is on terms and techniques of literary analysis, and on the texts themselves within the changing culture of modern Spain. Class taught in Spanish.

203. Early Hispanic Texts. This course features early-modern Hispanic texts of both Spain and Spanish America. It concentrates on the literature of the sixteenth and seventeenth centuries with works such as the Lazarillo de Tormes, the Novelas Ejemplares of Cervantes, the poetry of Sor Juana Ines de la Cruz, and colonial texts included. Class taught in Spanish.

204. Spanish-American Literature: 1800 to Present. The course provides a representative survey of Spanish-American literature from Independence (nineteenth century) to the present within a cultural-historical framework. Works covered include poetry, prose fiction, and theater. Emphasis on textual analysis, with attention to diverse traditions and cultures of Spanish America. Class taught in Spanish.

205. Spanish Culture. This course explores the history and cultural development of modern Spain through a variety of media such as art, literature, and film. Although topics range from the early cultural life of the peninsula to the implications of the expulsion of Moslems and Jews, and from Spain's overseas empire to the Spanish Civil War, emphasis is placed on contemporary issues, such as Basque separatism, the European Union, hosting the Olympics, and immigration. Class taught in Spanish.

206. Spanish-American Cultures. This course explores the ideas and events shaping the culture(s) of Spanish America, from pre-Columbian times to the present, with an emphasis on the concepts of discovery, conquest, mestizaje, and the formation of national cultural identity. Strong consideration is given to contemporary issues. Texts are drawn from literature, sociology, anthropology, history, the arts, and film. Class taught in Spanish.

207. Spanish in Summer Study Abroad. Please see SP 157 for the course description. Students in SP 207 enroll in advanced-level courses in language, literature, and culture at the Institute in Oaxaca or in Quito, Ecuador. Sites vary by year.

NOTE: Many courses numbered SP 215 and above are cross-listed with CLT and/or film and media studies, women's studies.

215. Don Quixote. This course entails a close reading of the novel in English translation, coupled with a focus on the ways in which both the novel and/or the protagonist have been adapted, adopted, interpreted, or incorporated by various critical and popular traditions both inside and outside of Spain from the time of its original publication in 1605 through the twenty-first century. The course examines several filmic adaptations, illustrations, and paintings as well as with an eye toward critically examining the problematic employment of *Don Quixote* as an icon of pan-Hispanic culture. However, students continually return to the novel as their anchor throughout the course, while assessing the constantly changing ways in which contemporary readers and scholars approach the text. Course is taught in English.

216. The Picaresque Novel. Conducted in English, with readings in the original language or in English, the course investigates the *Lazarillo de Tormes*, Mateo Aleman's *Guz-man de Alfarache*, Quevedo's *Buscon*, Grim-mel---shausen's *Simplizissimus*, Defoe's *Moll Flanders*, Smolett's *Roderick Random*, Le Sage's *Gil Blas*, and Thomas Mann's *Felix Krull* in an attempt to determine whether there is a picaresque genre and to explore the dialectic between morality and criminality in the growth of the early European novel.

217. El Quijote. A reading of Parts I and II of the novel. The basic assumption is that *Don Quijote* constitutes the richest and the most authoritative statement about the theory and practice of fictitious prose narrative and that it fully anticipates all the major developments in the novel in the West in the seventeenth, eight-eenth, and nineteenth centuries. Class is taught in Spanish.

218. Cervantes and the Rise of the European Novel. Theoretically and practically, the writings of Cervantes constitute the most persuasive and authoritative model for the art of fictional narrative in the West. Cer-vantes went to Great Britain and thence to the continent above all through the agency of the *Quijote*. Readings include *Don Quijote* in terms of its European futurity, passing from it to Defoe (*Crusoe*, *Roxana*), Fielding (*Tom Jones*), Scott (*Rob-Roy*), Dickens (*Our Mutual Friend*) and, finally, Balzac (*Lost Illu-*

sions). A critical constant in the course, conducted in English and with the readings in Spanish, French, or English according to students' language competence, is the question of artistic propagation and descent in the novel.

220. Golden Age Drama. Selected plays in verse by the very great: Cervantes, Lope de Vega, Tirso de Molina, and Pedro Calderon de la Barca. Emphasis on comedy, honor, and the aesthetics of wife-murder in representative works. Class taught in Spanish.

222. Spanish-American Colonial Literature. This is more a literary than a historical investigation of the period. The emphasis is on the experience of otherness in major texts such as Nunez's *Naufragios*, Ercilla's *Arau-cana*, Garcilaso's *Comentarios Reales*, and the poetry of Sor Juana Ines de la Cruz. Class taught in Spanish.

230. Nineteenth-Century Spanish Prose. Examines the nineteenth century as a time of confrontation and contradiction; as a bridge between tradition and modernity, reason and superstition, cultural affirmation and revolution. Explores Spanish culture from the early 1800s through the crisis of 1898 in a broader European cultural context. There is a selection of texts representing the movements of romanticismo, costumbrismo, realismo, and naturalismo. Class taught in Spanish.

231. The Generation of 1898 and Modernismo. In both Spain and Latin America the closing years of the nineteenth century and the dawning of the twentieth demanded critical revisions in the areas of politics and aesthetics. Intellectuals—writers, artists, and musicians alike—confronted the "ruins" of the past, seeking in their place new expressions of sublime beauty, liberty, spirituality, and sensuality. Revision or destruction? Tradition or innovation? Nationalism or "Enlightenment"? Woman as angel or demon, muse or serpent? From Nicaraguan Ruben Dario to Cuban Jose Marti, and in Spain from Valle-Inclan to Unamuno, this course explores the creation of the "fin de siglo" subjectivity in its multiple forms during the "decadent" transition from the "old" to the "new." Class taught in Spanish.

245. Twentieth-Century Spanish Theater. Explores trends in Spanish theater from the early twentieth century (Valle-Inclan, Garcia Lorca, Benavente) through post–Civil War censorship (Casona, Buero, Sastre, Arrabal, Ruibal) to the most recent innovations at the millennium (Ana Diosdado, Antonio Gala, Francisco Nieva, Paloma Pedrero, etc.). Also considers cinematic versions of plays to compare techniques and forms of performance and representation. Class taught in Spanish.

246. Modern Spanish Prose. Examines dev-elopments in the Spanish novel after the Civil War, from its resurgence with Cela to the experimental novels of the 1960s and 1970s, then the euphoric texts of the post-Franco transition to democracy. Emphasis on confrontations between social and aesthetic considerations in the texts. Readings include works by Cela, Matute, Goytisolo, Martin Gaite, Tusquets, Benet, Perez-Reverte and Javier Marías. Class taught in Spanish.

247. Modern Spanish Poetry. Analysis of selected works of poetry from the generation of 1927 to the present. May include readings by Juan Ramon Jimenez, Rafael Alberti, Jorge Guillen, Federico Garcia Lorca, Luis Cernuda, Pedro Salinas, etc. Class taught in Spanish.

248. Spain's Transition to Democracy. The process of redefining national, regional, and cultural identities in Spain since the death of Franco in 1975 parallels and even prefigures the collapse of the Berlin Wall and the map of the world drawn during the Cold War era. Spain's transition from dictatorship to democracy involves a complex number of issues, including the legalization of opposition political parties, a new constitution, King Juan Carlos halting a rightwing coup, the election of Felipe Gonzalez and the Socialists in 1982, and the advent of a united continent. The mass media have played a central role in this transformation, as evidenced by the film industry in particular as exporter of the icon of Modern Spain as a cultural commodity in the New Europe. This course focuses on representations of nationalism, autonomous identities, and alternative aesthetics in post-Franco Spain in a variety of media. Class taught in English.

249. Topics in Spanish Literature and Culture. Topics vary and may include Cervantes' "novelas ejemplares," the visual arts and the Spanish Civil War, the works of Garcia Lorca and Salvador Dalí, Spanish women's writing, and other topics that consider the relations between literature and other disciplines (film, philosophy, history, music, etc.).

249A. Stories from Spain. This course examines a variety of realist novels, psychological thrillers, erotic tales, heroic narratives, and coming-of-age tales from nineteenth- and twentieth-century Spain. Discussions concentrate on the evolution of twentieth-century democracy—the Spanish Civil War, the death of Franco, the Constitution of 1978, women's rights movements, and hopes for modernization—through the literary reflection of social issues, cultural debates, and political dreams. Class taught in Spanish.

255. Twentieth-Century Spanish-American Theater. Examines major currents in theater through the analysis of representative works by Florencio Sanchez, Roberto Arlt, Rodolfo Usigli, Jose Triana, Griselda Gambaro, and others. Class taught in Spanish.

256. Contemporary Spanish-American Prose. This course covers the modern prose classics of Spanish America by authors such as Alejo Carpentier, Juan Rulfo, Gabriel García Márquez, Elena Garro, Mario Vargas Llosa, Jose Donoso, Manuel Puig, and Manuel Zapata Olivella. Readings of major novels explore why these authors have achieved international literary fame. Readings also explore other kinds of fiction that have been written in modern Latin America since the "Boom" and the "new narrative." Class taught in Spanish.

257. Latin-American Theater and Poetry. Poetry is often thought to be the most private or intimate of the literary genres, and theater, the most public. Spanish-American poets and dramatists of the twentieth century stretched the limits of "everyday" language and literary conventions in order to give original expression to both private passions and public conflicts and to challenge the boundaries between them. This course studies the major works and the cultural contexts of ground-breaking voices from a variety of Spanish-

American countries; Pablo Neruda, Cesar Vallejo, Alfonsina Storni, Rosario Castellanos, Jorge Diaz, Griselda Gambaro, and Jose Triana. Class taught in Spanish.

259. Hispanic Women and Globalization. This course examines Latin American intellectuals, activists, and feminists in the context of the challenges of the global economy. In the twenty-first century, how do these women envision their future? How do they see themselves? What role does immigration play in their lives? The course examines the ideas of intellectuals, politicians, and the popular classes in Latin America regarding their own societies and the U.S. Includes photographic, cinematic, and written texts. Issues of sexuality, education, the family, and culture are considered in readings, films and videos, art and music, and in conversations with guest speakers. Class taught in English.

260. Latin American Women Writers. Through study of texts (mostly novels) written by women from Latin America, broad questions concerning cultural contexts with respect to sexuality and gender, language, aesthetics, psychology, and social issues are addressed. The course uses materials from a variety of fields (literary and cultural theory, film studies, psychology, history, sociology, anthropology, feminist studies) in addition to the primary texts. All texts and discussions in English. Emphasis on collaborative research and progressive writing assignments.

261. Facing Facts: Nonfiction Writing in Twentieth-Century Latin America. This century's periods of social and political upheaval in Spanish America are well documented by a variety of texts that claim to tell the truth about historical events. Many of these texts acquire the status of "literature" and not mere "reporting." This course asks the following questions: How have Spanish-American writers constructed factual, truth-telling texts? What impact has photography had on the writing of nonfiction? What expectations do we as readers bring to documentary literature? How are the lines drawn—and blurred—between factual and fictional discourses? Readings are chosen to represent revolutionary Mexico, labor struggles of the 1920s, revolutionary Cuba, the repression in the Southern cone, the Central American insurgencies, and the survival of indigenous cultures. Class taught in English.

262. Topics in Spanish-American Literature and Culture. Topics vary from semester to semester. Possible topics include surrealism and the avant-garde in art and Hispanic literature, Mexican literature and culture, the Caribbean, and other areas of interdiscipli-nary study.

262B. Cuba XXI: The Utopian Island. Now that the twenty-first century has arrived, we cannot help but picture a Cuba "without Fidel." But what does that mean? How do those in Cuba imagine their nation down the road? How does the Cuban community in Miami represent its hopes and dreams? This course examines art, film, and literary texts from the "homeland" *and* from the diaspora to compare and contrast images that negotiate between the past and the future. Course taught in English. Readings may be done in English or Spanish (for SP credit).

262D. Culture and Literature of the Caribbean. This course focuses on the
Spanish-speaking Caribbean within the larger cultural, historical, and political context of the Caribbean Basin. The course examines indigenous, European, and African influences on the molding of national cultures and identities as found in literary, cultural, and theoretical texts. Readings include examples from modern and contemporary Cuba, Puerto Rico, the Dominican Republic and Yucatan. Writings of Nicolas Guillen, Eugenio Maria de Hostos, Jose Marti, Roberto Fernandez Retamar, Ana Lydia Vega, and writers and artists of the Caribbean diaspora. Class taught in Spanish.

270. Hispanic Short Story. This course examines the particular aesthetic and formal challenges of the short story genre in texts from both Spain and Latin America. From realism to science fiction, and from the humorous to the grotesque, the course explores the narrative possibilities of a variety of short texts. Authors include Clarin, Quiroga, Tusquets, Cortazar, Borges, Chacel, Moix, and others. Theoretical issues related to the short story are discussed along with primary texts. Class taught in Spanish.

271. Popular Culture in Hispanic Societies. A consideration of popular genres such as the comic, the detective story, the fotonovela, the telenovela, and the novela rosa within a broader Hispanic cultural context. Examines popular interpretations and reflections of high culture and the crossovers between them. Considers the subversion of popular genres, the function of satire and parody, and intertextual relations in order to discuss the uses, abuses, and mass consumption of these products. Theories of popular culture are compared and contrasted; texts drawn from both written and visual sources. Class taught in English. Readings and papers may be done in Spanish (for SP credit).

272. Visions of the Millennium. Dead end or new beginning? Our fantasies about the future have met reality face to face as we crossed into the twenty-first century. Will we now inhabit a utopia of science and technology? Or will we live amidst the ruins of our worst social and ecological nightmares? This course examines how a variety of cultures across Europe and the Americas envision the future and what images they/we use to represent hopes, dreams, and fears. Includes a variety of sources, from written texts to the arts and film. Course taught in English.

281. Other Bodies. This course examines the representation of radical otherness in what is frequently represented as a single homogeneous body of Hispanic culture. The politics of reading, the problematizing of deviance and pornography, the narration of sexual and ethnic difference, and the quest for less rigid forms of subjectivity are some of the issues explored. Readings include texts by Goytisolo, Donoso, Puig, Zapata, Tusquets, Garcia Lorca, Peri Rossi, and Castellanos; films by Pedro Almodovar, Eloy de la Iglesia, and other directors from the Americas and Europe. Course taught in English.

282. U.S. Latinos/Latinas. This course introduces students to the emergent field of U.S. Latino/Latina writing and culture. The course examines two among the many provocative questions for the twenty-first century: (1) What will be the effects of further

Latin-ization of the American urban landscape? and (2) What does "buscando America" mean for different cultural groups and social classes? Readings and discussions include: Mike Davis (*Magical Urbanism: Latinos Reinvent the U.S. Big City*); Junot Diaz (*Drown*); Sandra Cis-neros (*The House on Mango Street*); and texts by Piri Thomas, Julia Alvarez, John Rechy, Ana Castillo (*The Goddess of the Americas*), Rich-ard Rodriguez (*Days of Obligation*), Rod-olfo Acuña, Helena Maria Viramontes, Gustavo Pérez Firmat, Ilan Stavans, and others. Class taught in English.

287. Latin American Film. From the very first encounters, the Americas excited in the outsiders' imagination a host of mythical and legendary images. While the first such crisis of representation occurred in other forms and texts, in the twentieth century the cinema has been the medium of cultural encounter and resistance. This course examines a variety of films produced by and about Latin America, its history and inhabitants. Questions of self-representation, cultural boundaries, gender identities, and the image of the nation are explored, as are issues of commercial cinema versus the art film. Topics vary from semester to semester. Class taught in English. Written work in Spanish for Spanish credit.

287A. Mexican Film. From the very first encounters, the Americas excited in the outsiders' imaginations a host of mythical and legendary images. While the first such crisis of representation occurred in other forms and texts, in the twentieth century the cinema has been the medium of cultural encounter and resistance. This course examines a variety of films produced by and about Latin America, its history, and inhabitants. Questions of self-representation, cultural boundaries, gender identities, and the image of the nation are explored, as are issues of commercial cinema versus the art film. Class taught in English but may also be taken for Spanish credit.

288. Spanish Film. Devoted to the critical analysis of recent Spanish cinema within its cultural contexts. Beginning with the early post–Civil War period, the focus is on film as the narrative representation of radical changes and transitions in Spanish society. Considers the translation of other media (literary, theatrical, etc.) into film and the problematic relationship between historical "reality" and the aesthetics of cinematic representation. Emphasis on films from the democratic transition to today. Includes films by directors such as Buñuel, Erice, Saura, Trueba, Garcia Sanchez, Almodovar, de la Iglesia, Amenabar. Class taught in English. Written work in Spanish for Spanish credit.

289. Women in Hispanic Film. Critics tend to divide the representation of women in Hispanic films into mutually exclusive, confrontational categories such as virgin or whore, maternal or seductive, traditional or modern, icon or fallen idol. This course examines images of women in a variety of films from Latin America and Spain to problematize these artificial divisions, and to seek out the ambiguous and conflictual aspects of personal (and national) identity embodied in them. Topics range from the use of "the feminine" in war propaganda (Spain, Cuba, and Central America) to films of the Franco dictatorship, and from Latin American political documentaries to popular commercial films by directors such as Bunuel, Almodovar, Bemberg, Saura, Arau, Leduc, and Novaro. Emphasis on cinematic representation as visual ideology, and on films at the millennium. Class taught in English. Written work in Spanish for Spanish credit.

MUSIC

Paul Burgett, Ph.D. (Eastman School of Music) *Adjunct Professor of Music*
John Covach, Ph.D. (Michigan) *Professor of Music and Chair of the Department; Professor of Music Theory, Eastman School of Music*
David Harman, D.M.A. (Eastman School of Music) *Professor of Music; Director of Chamber and Symphony Orchestras*
Kim H. Kowalke, Ph.D. (Yale) *Professor of Music and Richard L. Turner Professor of Humanities; Professor of Musicology, Eastman School of Music*
Honey Meconi, Ph.D. (Harvard) *Professor of Music; Professor of Musicology, Eastman School of Music*
Matthew BaileyShea, Ph.D. (Yale) *Associate Professor of Music; Assistant Professor of Music Theory, Eastman School of Music*
Bruce Frank, D.M.A. (Eastman School of Music) *Instructor in Music*
Jason Titus *Lecturer in Music*
Susan Conkling *Director of Women's Glee Club*
Irina Georgiana *Choral Conductor*
Josef Hanson *Director of Brass Choir*
Jason Holmes *Director of Gospel Choir*
Harold McAuliffe *Director of Men's*

Glee Club
William Tiberio *Director of Wind Symphony and Jazz Ensemble*
Zora Mihailovich *Piano Artist-in-Residence*

Eastman School of Music Graduate Assistants

The Department of Music offers courses of study leading to the B.A. degree with concentrations, a minor, and eight clusters in music. A wide variety of nontechnical courses addresses nonconcentrators who wish to study music on an introductory, interdisciplinary, or aesthetic basis. Degree programs, course offerings, and performance opportunities in music are diverse and invite choice and flexibility. Courses offered at the Eastman School of Music (ESM), normally open to any student presenting the proper prerequisites, augment the range and depth of musical experiences and courses available to students in the College. (For information concerning the Bachelor of Music degree and courses offered at Eastman, consult the Eastman School's official bulletin.)

MUSICAL ENSEMBLES AT THE RIVER CAMPUS

Requirements for the music concentration require four semesters of participation in one or more faculty-directed ensembles sponsored by the College music department: Men's Glee Club, Women's Glee Club, Chamber Singers, Gospel Choir, Jazz Ensemble, Wind Symphony, Chamber Orchestra, Symphony Orchestra, Gamelan. Concentrators are encouraged to participate in one or more ensembles beyond the minimum requirement, although no more than 8 credits can be applied toward the degree (the performance track is an exception). Concentrators can also participate in Chamber Ensembles and Brass Choir, but it will not count toward fulfillment of the ensemble requirement.

In addition, there are a number of student-organized musical groups.

PRIVATE INSTRUMENTAL AND VOCAL INSTRUCTION

Credit Lessons

Any full-time, matriculated student may audition for lessons at the Eastman School of Music. Minimum standards of proficiency are established by the various Eastman departments; students demonstrating those standards may take lessons for collegiate credit. The Department of Music's Performance Manager provides the required audition application on request.

Most students meet with their instructors once a week for a 30-minute lesson, receiving 2 credits. Students who qualify for one-hour lessons may be awarded additional credit. The addition of private lessons to a normal 16-credit-hour semester is not considered an overload. No more than 16 credit hours may be counted toward the B.A. degree.

Noncredit Lessons

Students may take lessons without credit by enrolling directly in the Eastman Community Music School (ECMS). Cost of this instruction is not included in regular college tuition; students are billed directly by the Eastman School. College credit will not be awarded for these lessons nor will such lessons appear on the student's permanent record at the University. However, ECMS awards grades for all study, and a transcript of such study is available through ECMS.

Practice Facilities

Practice facilities on the River Campus are open to members of the University community. Keys are available in the music department office.

THE B.A. WITH A CONCENTRATION IN MUSIC

The Department of Music in the College offers the Bachelor of Arts degree with a concentration in music. This degree program in music ad-dresses students who can meet both the intellectual and musical challenges of a rigorous pro-gram that emphasizes the broad experience of a liberally educated person. The con-centration comprises a balanced program of academic courses, private instruction, and ensemble experience that fosters understanding of musical languages, historical developments, and compositional styles while encouraging excellence in performance. The core curriculum in music theory and history provides the common foundation for advanced study of specialized tracks within the concentration (composition, conducting, music history/theory, music in world cultures, musical theater, performance, and popular music/jazz) and excellent preparation for study at the graduate or professional level.

Information about the honors program is available from the department office.

Although the concentration in music is a

demanding one, students often explore, beyond the introductory level, one or more nonmusic disciplines as well. Some students pursue a double major.

Students who concentrate in music in the B.A. program at the University of Rochester usually demonstrate significant prior musical experience. Applicants to the College who are considering a concentration in music are encouraged to submit a recorded audition as part of the admission process so that musical achievement can be considered in the admission decision and the student can be advised of placement in private instruction at the Eastman School; pianists can often audition in Rochester and should contact the department office to schedule an audition. Students are admitted to the music concentration by the music faculty after a review, usually in the sophomore year, of their academic records and musical prog-ress.

THE B.A./M.A. PROGRAM IN MUSIC EDUCATION WITH TEACHING CERTIFICATION

The College music department and the Eastman School's music education department offer an option allowing a limited number of undergraduates to get an early start on a Master of Arts degree in music education at Eastman. The program normally takes five and one half to six years to complete. Along with the master's degree, students also receive initial certification for teaching music in the New York State public school system. Students interested in the program should consult Josef Hanson in their first year at the University, since a detailed program of study needs to be carried out. Students apply for the M.A. degree during the second semester of their junior year. Details are available from the music education department at the Eastman School, (585) 274-1540.

THE 3+2 B.A./M.A. PROGRAM IN ETHNOMUSICOLOGY

Students must complete required theory, history, musicianship and keyboard skills, and performance requirements (studio instruction and ensembles) of one B.A. music track; must include a World Musics (MUR 121 or 6MHS 281 or 282) course. Students must maintain a minimum 3.0 GPA in required courses. An entrance audition/interview at ESM in is required as part of admission to the M.A.

REQUIREMENTS FOR THE MUSIC CONCENTRATION

A concentration in music comprises 63–73 credits, depending upon background, pre-college preparation, and the particular track selected. All music concentrators are required to take the core courses as listed below. Requirements for ensemble, private instruction, and electives vary with the track. The core courses include

1. Music theory (16 credits): MUR 111, 112, 211, 212.
2. Musicianship (24 credits): 109, 113, 114, 115.
3. Music history (20 credits): MUR 221, 222, 223, 224.
4. Ensembles (four semesters in a faculty-directed ensemble sponsored by the College music department):
5. Private instruction (four semesters): Upon presenting a successful audition, full-time matriculated students are assigned studio instruction at the discretion of the dean of academic affairs at Eastman.
6. Keyboard skills (4 credits): Students must demonstrate keyboard facility prior to graduation either by successfully completing MUR 116 and 117 or by passing the equivalent proficiency test for each course.
7. Music electives (8 credits): Credits may be chosen from any MUR course numbered 120 or higher and/or ESM course numbered 200 or higher, except ESM's MHS 421–426. Unless stated otherwise in the requirements for the track, no ensemble or private instruction credits may be included. (See the *Official Bulletin: Eastman School of Music* for its course offerings and credit hours.)

In accordance with University policy, no more than 20 courses or the equivalent number of credit hours from a single department may be applied toward the degree. Although the requirements for the concentration in music can be met in three years, students considering a music concentration are urged to begin the music theory sequence in the fall semester of their first year. Students with limited background in music who do not qualify for Theory I should enroll in MUR 110, Introduction to Music Theory, during their first year.

THE MINOR IN MUSIC

A total of 28 credit hours are required, with 8 of those credits specifically designated: MUR 111 and MUR 134. The remaining 20 credits are to be chosen from MUR courses numbered 112 or higher and/or ESM courses numbered 200 or higher. No more than 8 credits can be derived from studio instruction and ensembles combined.

UPPER-LEVEL WRITING REQUIREMENT

The College's discipline-based writing requirement will be satisfied by successful completion of the music history sequence (MUR 221–224), which offers ample opportunity for various modes of written discourse.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

100. Experiencing Music. A new approach to "music appreciation" that could be offered only at the University of Rochester, with its extraordinary musical resources, including nearly 800 concerts and recitals per year, a professional-quality recording studio, and the largest academic music library in the New World. This enjoyable course celebrates the "ears-on" experience of various aspects of musical performance and assumes no previous technical training in music. Participants develop listening skills through the enjoyment of live musical presentations, in-class performances, discussions with the performers and living composers and guided listening sessions. Students attend some rehearsals and concerts, including at least one Rochester Philharmonic concert at the Eastman Theatre. Web sites and other technological media are also used in lieu of traditional text.

101. Elements of Music. A course for the student with no previous musical experience. Topics include notation, intervals, chords, and other basic concepts of tonal harmony, with application to the study of a wide range of styles including popular idioms..

103. Musical Adventures: A Trip Too Hip to Miss. Bach to Coolio—and lots of stops in-between. With their backpacks filled with a few essentials for the journey—some musical vocabulary and grammar—students explore the wonderful world of music. The course explores such questions as "What is music?" and "Why humans make it?" Students discuss what one another thinks is musically "mint" and musically "gross" and why. The class explores the interesting world of musical forms and styles found in exciting places including head trips to Europe—to places like Italy, Germany, England and France—New Orleans, Chicago, and Harlem. The search for music goes from concert halls to church halls, from beer halls to dance halls, and encounters Dukes and Counts and Princes and Queens, royal and otherwise. And because everyone has some spirit of invention, students may even try their hand at a little musical creation. Prerequisite: none.

109. Musicianship I: Literacy Skills. Credit—1 hour. This course introduces students to basic musicianship skills. The course begins with exercises in pitch matching and basic interval recognition and progresses toward other skills, such as singing simple melodies at sight, sight-reading various rhythmic patterns, and dictating simple melodies and chord progressions. It is recommend that prospective music majors, especially those with prior singing experience, skip this course and begin with MUR 113.

110. Introduction to Music Theory. Basic concepts of music theory, addressing students with some musical experience in an instrument or voice, but little or no music theory. Scales, keys, intervals, chords, basic part-writing, and other fundamental aspects of musical structure. Some ear training and aural skills. Students who have completed MUR 101 should NOT register for MUR 110.

111. Theory I. The first in a four-course sequence. Deals with basic elements of harmony, voice-leading, and analysis. Part-writing in chorale style teaches elementary aspects of tonal theory. Prospective music majors should begin their theory requirement with this course

112. Theory II. Continuation of MUR 111. This course continues with chorale and keyboard-style harmony exercises, but introduces chromaticism, modulation, and analysis of form and phrase structure.

113. Musicianship II. Credit—1 hour. This course develops basic musicianship skills with an emphasis of diatonic sight-singing, rhythmic sight-reading, and dictation of diatonic melodies and chord progressions. The exercises and in-class activities are similar to
MUR 109 but at a more advanced level.

114. Musicianship III. Credit—1 hour. Continuation of MUR 113 with an emphasis on increased chromaticism, especially simple modulation and mode mixture. The course puts emphasis on ensemble singing and aural analysis. (Fall and Spring)

115. Musicianship IV. Credit—1 hour. Continuation of MUR 114 with greater emphasis on chromaticism and aural analysis.

116. Keyboard Skills I. Credit—2 hours. Keyboard use as a vehicle for broader musical development. Basic piano technique, sight-reading of simple chord progressions, realization of figured bass, basic improvisation. No prior keyboard training required. Prerequisite: permission of instructor.

117. Keyboard Skills II. Credit—2 hours. Continuation of MUR 116. Completes piano proficiency for music concentrators. Prerequisite: MUR 116 or permission of instructor.

118. Beginning Piano for Non-Music Majors. Credit—2 hours. An elective course for non-music majors from River Campus who have little or no previous keyboard instruction. The course includes technique, fundamental skills, and repertoire. (Fall)

119. Beginning Piano for Non-Music Majors II. Credit—2 hours. Prerequisite: MUR 118 or permission of instructor.

120. Symphony and the Conductor. Offers the student a glimpse into the world of standard orchestral performance as well as an overview of the métier of the orchestra conductor. Although some background in basic music theory is helpful, there are no technical musical prerequisites; only a love for and active interest in symphonic music and the process of its preparation and performance. In addition to class lectures, students visit orchestral rehearsals off and on campus; view videotapes on reserve; enjoy guest lectures by local conductors, arts managers, and orchestral musicians; and attend orchestra concerts. Prerequisite: MUR 111.

121. World Musics. Theater music from China and Japan, Indian and Indonesian classical music, ritual and ceremonial music from West Africa, Eastern Europe, and the United States. Focuses on musical sound structures and social, political, and religious contexts for musical performances. Prerequisite: none.

122. History of Jazz. This study of jazz, as an American musical art form, is structured around the lives and music of jazz musicians, across a range of instrumental, vocal, and ensemble genres. Less a strictly chronological approach, this course focuses first on jazz ti-

tans, those individuals and musical groups distinguished by their seminal and permanent influences, either with long tenures such as Louis Armstrong, Miles Davis, or Coleman Hawkins or shorter but intense careers, such as Charlie Parker. Integrated with the jazz titans is consideration of the music of other important jazz musicians whose contributions are essential to helping shape and inform the vast jazz landscape of the twentieth century. Blues, ragtime, swing, bebop, cool, progressive, and free jazz are landmark terms that help define that landscape. The influence of jazz on composers in European "classical" traditions is also considered. And finally, study of the musical history is enhanced by considerations from sociological, linguistic, and philosophical perspectives. The instructional format includes class lectures and discussion and an intense emphasis on listening. This course is designed for students with little or no musical training; simple technical, musical vocabulary and concepts are provided. In addition to reading and listening assignments, there are several brief written assignments and two exams. Prerequisites: none.

123. Music of Black Americans. Black American Christian musical beginnings including forms of worship, early musical practices, the spiritual, evolution of Gospel. Antebellum musical activities, Harlem renaissance, literary contributions of writers such as Langston Hughes and Georgia Douglas Johnson. Blues and classical music forms from late-nineteenth to mid-twentieth century, theater music from minstrelsy to Broadway, syncopated dance orchestra and brass bands, bebop. Prerequisite: none.

125. History of Rock Music. Emphasizes primarily 1955–1990, with limited consideration of 1900–1955 and 1990–present. Identifies rock-music styles within historical context of development, transformation, and interaction of pop styles. Technological development, social, political, and cultural context, race and gender, and music-business practices. Knowledge of technical musical terms and ability to read music are not required. Prerequisite: none.

126. Opera. A small number of representative operas are used to highlight the history of this controversial 400-year-old art form and its creators, performers, and audiences. Drama, music, staging, spectacle, and dance are all examined as components of production. Divas welcome. Prerequisite: none.

127. The Blues. For description, see REL 151.

128. Women and Music. Women composers, women as performers, patrons, and consumers. Influence of gender on the experience of music. Prerequisite: none.

130. The Beatles, the British Invasion, and Psychedelia. The history of the Beatles' career and music is explored in the context of the band's stylistic development, as well as against the backdrop of social, cultural, technical, and music-business events and issues in the 1950s, '60s, and '70s. No background in music theory or ability to play a musical instrument is required.

131. Rock Music in the 1970s. This course surveys rock music in the 1970s, paying special attention to ways in which '70s styles developed out of '60s styles. Artists considered include Jimi Hendrix, Cream, Yes, Led Zeppelin, The Who, The Allman Brothers, The Eagles, Black Sabbath, The Cars, Tom Petty, The Sex Pistols, and Elvis Costello, plus many more. No previous musical training is required.

133/233. Musical Theater Workshop. Intensive practical experience with scene-and-song work in popular musical theater repertory. Weekly rehearsals and critique sessions; emphasis on characterization, technical skills, subtextual dimensions, stylistic considerations, preparation for performance. Initial and concluding videotaping of "audition piece." Prerequisite for MUR 133: one year of voice instruction. MUR 233 offers advanced techniques of singing and acting for the musical stage. Prerequisite for MUR 233: MUR 133 or permission of instructor.

134. Musical Style and Genre. An introduction to the history of Western classical music from the Middle Ages to the present, with emphasis on recognition of the chief stylistic characteristics and understanding of major genres of each period. Prerequisite: MUR 110 or 111.

135. Sondheim and the Modern Musical Theater. Survey of the modern musical theater through the works of Stephen Sondheim, from *West Side Story* through *Passion*. A brief history of the American musical from *Show Boat* through the mid-fifties, then in-depth study of each of Sondheim's major Broadway musicals. Analysis of lyrics, musical forms and idioms, process of adaptation and production. Prerequisite: ability to read music or strong background in the musical theater.

136. Shakespeare and Music. Music is inextricably woven into the plays of Shakespeare, and those plays have inspired composers for hundreds of years. The course investigates the musical world of Shakespeare's day, the specific uses of music within his plays and their revivals, and the musical representation of Shakespearean themes by later composers, including Mendelssohn, Verdi, Tchaikovsky, Prokofiev, and Britten. Prerequisite: none

139. Judaism and Its Music. For description, see REL 217.

150. Women's Glee Club. Credit—1 hour. Prerequisite: audition.

151. Men's Glee Club. Credit—1 hour. Prerequisite: audition.

152. Chamber Singers. Credit—1 hour. Prerequisite: audition.

153. Symphony Orchestra. Credit—1 hour. Prerequisite: audition.

154. Chamber Orchestra. Credit—1 hour. Prerequisite: audition.

155. Chamber Ensembles. Credit—1 hour. Prerequisite: audition.

156. Wind Symphony. Credit—1 hour. Prerequisite: audition.

157. Jazz Ensemble. Credit—1 hour. Prerequisite: audition.

158. Gospel Choir. Credit—1 hour. Prerequisite: none.

159. Gamelan Ensemble. Credit—1 hour. Prerequisite: none.
160. Advanced Piano Study. Weekly one-hour private lessons with artist-in-residence. Advanced students learn how to practice efficiently, develop new repertoire, improve piano skills and technique. Prerequisite: audition and permission of instructor.
161. Broadcasting in the Digital Age. Descriptive and critical analysis of electronic mass media, broadcast practices, and impact. Historical development of mass media institutions and role of media in society, including evaluation of news, government regulation, economics, emerging technologies, audience dynamics, decision making, organizational aspects of broadcast industry. Prerequisite: none.
162. Music and the Mind. Introduction to music cognition. Topics include empirical methods, psycho-acoustic principles, influence of Gestalt psychology, music and language, metric and tonal hierarchies, music and the brain, aspects of musical development, and research on musical memory, expectation, and emotion. Prerequisite: MUR 111.
201. Basic Jazz Theory and Improvisation I. Rudiments of jazz, including chord and scale spellings, chord/scale relationships, jazz/pop chord symbol nomenclature, basic forms, chord substitutions, piano voicing; strong emphasis on ear training, vocalization, and transcription from records of jazz solos. -Prerequisite: MUR 111 or permission of instructor.
202. Basic Jazz Theory and Improvisation II. Continuation of MUR 201. Prerequisite: MUR 201 or permission of instructor.
211. Theory III. Continuation of MUR 112. Focuses on analysis of large forms, such as sonata, rondo, and song forms. Advanced study of chromatic harmony and modulation to remote keys. Prerequisite: MUR 112. (Fall)
212. Theory IV. Continuation of MUR 211. Explores theoretical and aesthetic principles of twentieth-century music, especially in relation to earlier compositional procedures. Introduces basic post-tonal theory, including set-class analysis, transformational theory, and serial techniques. Prerequisite: MUR 211.
214B. Analysis of Rock Music. Many
people love pop music for its simplicity, but this course reveals that pop music can often be surprisingly complex in the ways it projects structure and creates musical relationships. Many dimensions of pop music are analyzed, including harmony, melody, rhythm and meter, texture, form, recording technique, and text-music relationships. Prerequisite: MUR 211.
221. History of Western Music: Early Middle Ages to High Renaissance. Survey of Ancient, Medieval, and Renaissance periods of Western art music introduces repertory through extensive listening, analysis, reading assignments, and group performances. Prerequisite: MUR 112. (Fall)
222. History of Western Music: 1600–1750. Survey of Baroque and early Classical music. Explores little-known terrain of -seventeenth-century music and fosters an informed perspective of more familiar -eighteenth-century works (Bach, Handel). -Prerequisite: MUR 221.
223. History of Western Music: 1730–1850. Emphasis on analysis of masterpieces of tonal music and their relationship to society and the other arts. Lecture, with extensive listening and analysis; reading assignments. Several short analytical essays. Prerequisite: MUR 112. (Fall)
224. History of Western Music: 1850–Present. Emphasis on the changing meaning of "new music" and its role in society. Analysis of post-Wagnerian tonal music and non-tonal alternatives. Lecture, with extensive listening and reading, as well as medium-length papers. Prerequisite: MUR 223. (Spring)

NAVAL SCIENCE

Steven A. Borden, Captain, USN, M.A. (U.S. Army War College) *Professor of Naval Science*
Andrew E. Shuma III, Commander, USN, M.A. (U.S. Naval War College) *Associate Professor of Naval Science*
Matthew Hays, Lieutenant, USN, B.S. (Miami University) *Assistant Professor of Naval Science*
Michael Lyle, Lieutenant, USN, B.S. (Vanderbilt University) *Assistant Professor of Naval Science*
Tommy Parmiter, Captain, USMC (SUNY College of Environmental Science and Forestry) *Assistant Professor of Naval Science*
John White, Lieutenant, USN, B.S. (U.S. Naval Academy) *Assistant Professor of Naval Science*
The Department of Naval Science does not use teaching assistants in its instructional program.

Naval science studies are designed to prepare students seeking commissions in the U.S. Navy or U.S. Marine Corps through the NROTC Program. The University has had an NROTC unit on campus since 1943. The NROTC Program is open to both male and female students. Any student, not just NROTC midshipmen, may enroll in courses offered by the Department of Naval Science.

Students participate in the NROTC Program in one of three options:
1. NROTC SCHOLARSHIP PROGRAM students are selected by national competition. Applications may be submitted online at www.nrotc.navy.mil and are usually due by January of the senior year in high school. Students are subsidized by the Navy for tuition, fees, textbooks, and uniforms, and they receive a monthly
stipend during the academic year. Scholarship students may withdraw from the program at their own request without obligation at any time prior to the beginning of the sophomore year. Thereafter, the student is obligated to accept a commission as Ensign, USN, or Second Lieutenant, USMC, upon graduation and to serve on active duty for a minimum of four years and for a minimum of four years in the inactive reserve. Any questions should be directed to the Department of Naval Science on the ground floor of Morey Hall.
2. NROTC COLLEGE PROGRAM is available to first- and second-year college students and is specifically designed to provide an opportunity for students to earn a commission. Students are welcome to apply for the program by contacting any member of the Department of Naval Science for details. College Program students receive uniforms and a monthly stipend during the junior and senior years. College Program students are eligible to compete for either three- or two-year scholarships based on their performance in the program and, if successful, become Scholarship students. College Program students incur a service obligation upon beginning their junior year. They must agree to accept a commission as Ensign, USNR, or Second Lieutenant, USMCR, upon graduation and to serve thereafter on active duty for three years.
3. TWO-YEAR COLLEGE PROGRAM students may apply for the program by submitting their applications to the Professor of Naval Science. Sophomores who have two years of study remaining (including two summers) prior to receiving a baccalaureate or higher degree are eligible to apply. Students selected for the Two-Year College Program attend the Naval Science Institute for about six weeks during July and August at the Naval Education and Training Center, Newport, Rhode Island. Tuition, room, board, travel expenses, and modest subsistence are provided. The student is then eligible to join the NROTC College Program in the fall, assuming the same obligations as other College Program students.

ELIGIBILITY FOR NROTC PROGRAMS

In general, students must be U.S. citizens between 17 and 21 years of age and be physically qualified in accordance with standards prescribed for Navy midshipmen. More detailed information can be obtained from the Department of Naval Science office.

SUMMER TRAINING CRUISES

Students in the NROTC Program participate in summer cruises of approximately six weeks' duration as part of their training to become officers in the Navy or Marine Corps. Cruises are aboard naval ships, submarines, aircraft squadrons, and shore bases throughout the world. Four-year Scholarship students attend three such summer cruises. College Program students attend one such cruise, between the junior and senior years. Two-year Scholarship students attend one cruise. While on cruise, NROTC students receive room, board, travel expenses, and compensation equivalent to E-5 enlisted.

NAVAL SCIENCE STUDENTS

Any student in the University may take naval science courses. Credits for courses taken in the Department of Naval Science are determined by the college in which the student is pursuing his or her concentration. Students who are thinking about applying to an NROTC program are encouraged to enroll in a naval science course.

NROTC COURSE REQUIREMENTS

The following is the recommended sequence of naval science courses for midshipmen. Deviations from the recommended sequence are permitted; however, they must be approved by the professor of naval science.

First Year
- NAV 093. Introduction to Naval Science
- NAV 250. Sea Power and Maritime Affairs

Second Year
- NAV 265. Leadership and Management
- NAV 098. Navigation I (USN midshipmen)
- NAV 251. Evolution of Warfare (USMC midshipmen)

Third Year
- NAV 094. Naval Engineering (USN midshipmen)
- NAV 249. Naval Weapon Systems (USN midshipmen)
- NAV 099. Amphibious Operations I (USMC midshipmen)

Fourth Year

- NAV 222. Naval Operations and Seamanship (USN midshipmen)
- NAV 266. Leadership and Ethics

Various other courses, contained in a core curriculum, are prescribed for midshipmen depending upon their category/service. Details may be obtained from the Department of Naval Science.

OTHER ACADEMIC REQUIREMENTS

Midshipmen are encouraged to pursue courses of study leading to degrees in engineering,
physics, mathematics, and chemistry, but may also follow any program which leads to a baccalaureate degree. One year of calculus and calculus-based physics is required for all Navy Option scholarship midshipmen. Marine Option midshipmen will take Amphibious Operations (NAV 99), Evolution of Warfare
(NAV 251), and two electives, approved by the professor of naval science, during their junior and senior years, instead of the sequence listed previously.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

093. Introduction to Naval Science. Credit—none. Introduction to the Navy, including customs, traditions, seamanship, officer responsibilities, and naval careers. (Fall)

094. Ship Systems I. Credit—none. Detailed study of ship characteristics and types including ship design, hydrodynamic forces, stability, compartmentation, propulsion systems, and damage control. Basic concepts, theory and design of steam, gas turbine, diesel and nuclear propulsion are introduced. (Fall)

098. Navigation I. Credit—none. Relative motion and vector analysis theory (MOBOARD), naval operations, ship behavior and characteristics in maneuvering, applied aspects of ship handling, afloat communications, and command and control. In-depth study of the theory, principles, procedures, and application of plotting, piloting, and celestial navigation. Students learn piloting techniques; use of nautical charts and publications; the use of visual, radar, and electronic aids; and theory of operation of ship's compasses. Other topics include tides and currents, voyage planning, and the application and understanding of international rules of navigation. Naval operations are also discussed. The course is supplemented with review/analysis of navigational case studies. (Spring)

099. Amphibious Operations. Credit—none. This course analyzes a series of historical case studies in an effort to discern certain patterns and principles that provide the basis for a professional understanding of amphibious warfare. This is a history-based course and *not* doctrine-based (although the historical development of doctrine is addressed). The object is to educate the student in the characteristics, requirements, and problems of amphibious operations. (Spring)

222. Naval Operations and Seamanship. Credit—none. This course is a general introduction to Naval Operations at sea and covers topics in four broad sections, including (1) Maneuvering board, formation sailing, nautical rules of the road, and international laws of the seas; (2) Communications: security, radio procedures, tactical communications, and maneuvering; (3) Evolutions and Operations: shipboard watch-standing, ship-handling, and evolutions; (4) Naval Doctrine and Joint/Combined Operations. (Fall)

249. Ships Systems II. This course investigates the theories and implementation of naval weapons systems. The student explores the fundamentals of target detection (using radar and sonar), warhead and fuse design,
guidance and control principles, propulsion and launching, fire control, and mine warfare. Case studies are used during the course to aid the student in understanding the concepts of command, control, and communication. Current world events and historical issues are discussed as applicable. (Fall)

250. Sea Power and Maritime Affairs. A survey of all aspects of maritime affairs and the effects of sea power on national development. A discussion of historical events. (Spring)

251. Evolution of Warfare. Course provides the student with an understanding of the art, concept, and more detailed history in the evolution of warfare. Similar to the History of Amphibious Operations, it focuses on the beginning of recorded history to the present day. However, emphasis is placed on the historical and educational value while familiarizing the student with an understanding of the threads of continuity and the interrelations of political, strategic, operational, tactical, and the technical levels of war. This is a reading- and research-intensive course requiring the student to draw specific comparisons of the historical evolution of several countries, their leadership, and their warfare influences from the past, while bringing into focus the application of these same principles and concepts to the battlefields of today and the future. (Spring)

265. Leadership and Management. This course explores human nature and the underlying philosophies and principles of leadership. Application of these philosophies and principles is integrated into classroom discussions using appropriate case studies. (Fall)

266. Leadership and Ethics. This course explores the moral, ethical, and legal issues facing leaders in industry, society, and the military while reinforcing the key underlying principles of leadership. There is a heavy emphasis on case studies using a seminar format to underscore the issues. The overall objective of this course is to develop critical thinking and reasoning skills in leadership situations particularly those that pose a moral or ethical dilemma to the individual. (Spring)

PHILOSOPHY

Gregory N. Carlson, Ph.D. (Massachusetts) *Professor of Linguistics, of Philosophy, and of Brain and Cognitive Sciences*
Earl Conee, Ph.D. (Massachusetts) *Professor of Philosophy*
Randall Curren, Ph.D. (Pittsburgh) *Professor of Philosophy and of Education; Chair of the Department*
Richard Feldman, Ph.D. (Massachusetts) *Professor of Philosophy*
Ralf Meerbote, Ph.D. (Harvard) *Professor of Philosophy*
Deborah Modrak, Ph.D. (Chicago) *Professor of Philosophy*
Edward Wierenga, Ph.D. (Massachusetts) *Professor of Religion and of Philosophy*
Richard Dees, Ph.D. (Michigan) *Associate Professor of Neurology, of Philosophy, of Pediatrics, and of Medical Humanities*
Alyssa Ney, Ph.D. (Brown) *James P. Wilmot Distinguished Assistant Professor and Assistant Professor of Philosophy*
Brad Weslake, Ph.D. (Sydney) *Assistant Professor of Philosophy*
John Gates Bennett, Ph.D. (Michigan) *Senior Lecturer in Philosophy*
Rolf A. Eberle, Ph.D. (California, Los Angeles) *Professor Emeritus of Philosophy*
Robert Lawrence Holmes, Ph.D. (Michigan) *Professor Emeritus of Philosophy*
Dennis O'Brien, Ph.D. (Chicago) *Professor Emeritus of Philosophy*

The Department of Philosophy uses approximately eight teaching assistants in large lecture courses as graders or section leaders.

The Department of Philosophy offers programs leading to the B.A., M.A., and Ph.D. degrees.

The philosophers who are members of the Department of Philosophy have a variety of specialties in philosophy and represent diverse philosophical perspectives. Philosophical issues addressed in undergraduate courses include both traditional topics from areas such as epistemology, ethics, metaphysics, political philosophy, and the philosophy of science, and also the most recent contemporary concerns. The techniques brought to bear on these issues are analytical, formal, and historical. The undergraduate program stresses Western philosophy, ancient and modern, and gives particular emphasis to recent and contemporary Anglo-American philosophy. The department's course offerings provide an excellent foundation for graduate work in law and cognitive science, as well as in philosophy itself. A concentration in philosophy is also a valuable asset when combined with a concentration in political science, economics, or natural sciences such as biology, chemistry, geology, physics, and psychology.

The concentration requirements are designed to assure that students completing the program are familiar with the central texts in the history of philosophy as well as a variety of issues in contemporary philosophy. The department offers a general concentration in philosophy, as well as three specialized programs. One, the philosophy concentration with emphasis on law and ethics, is designed primarily for prelaw students and others who are interested in an extensive investigation of the nature of law, value, and social justice. The second special concentration emphasizes history and is designed for students with both scholarly and philosophical interests in the history of philosophy. The third special concentration emphasizes logic and the philosophy of science. It is designed primarily for students interested in one or more of the sciences who wish to pursue in depth the study of logic and the philosophy of science.

Philosophy majors must enroll in the seminar for majors (PHL 300) and one advanced in philosophy designated by a W to indicate upper-level writing credit. The W designation is available with the permission of the instructor. Both courses provide significant experience in writing through the assignment of a series of short papers, the discussion of philosophical writing, and guidance in the revision and rewriting of papers.

Undergraduates who wish to take advantage of the University's graduate offerings in philosophy may, with permission of the instructor and approval of the undergraduate advisor, take graduate seminars (see *Official Bulletin:Graduate Studies*, www.rochester.edu/GradBulletin).

The department sponsors a variety of internships that combine real-world experience with philosophical inquiry. Teaching interns in the Rochester City School District work with elementary school children on reading, writing, and critical thinking skills. Internships with the Ghandi Institute for Nonviolence provide students with a variety of opportunities to participate in the Institute's local, national, and international projects.

In the honors program in philosophy, qualifying majors work closely with a faculty member over an extended period of time. Honors students develop a research project over a one- to two-year period, and complete a graduate seminar or undergraduate seminar

approved for honors credit. In addition to graduating with honors, this provides an invaluable experience in philosophical research and writing.

1. *To qualify:* Admission to the honors program is limited to those students who have at least an A– average (3.7 GPA) in their philosophy courses and show promise of being able to complete an honors thesis.

2. *To apply:* Interested students should contact the departmental undergraduate advisor to confirm that they qualify and to find a faculty advisor. This can be done in one of two ways: (a) talk to a faculty member they would like to work with, and settle upon a mutually agreeable topic; (b) if they know the topic they want to work on, ask around until they find a faculty member who is interested in supervising work on that topic.

3. Honors requirements:

a. 4 credit hours of Honors Tutorial (PHL 392), ideally taken as two 2-credit courses during the junior year. This tutorial is devoted to reading in preparation for writing an honors thesis.

b. 4 credit hours of Honors Thesis (PHL 393), ideally taken as two 2-credit courses during the senior year. The thesis must be finished and submitted by April 1, and defended orally by the last day of classes. The examining committee consists of the honors advisor, the department undergraduate advisor, and a third faculty member. All three members must approve the thesis before an oral examination can be scheduled.

c. 4 credit hours of a graduate seminar (500 level) or an undergraduate seminar (300 level) approved for honors credit, taken during the junior or senior year. If an undergraduate seminar is to be used to meet this requirement, the instructor must be notified of this in advance so that arrangements can be made for any additional work that the instructor deems necessary to approximate a graduate-level experience.

d. To receive honors the student must satisfy these requirements (a–c) with an A– average. In computing this the thesis will be given the most weight (40 percent), and the tutorial and seminar somewhat less (30 percent each).

The bachelor's degree with distinction is offered on recommendation of the department and is based primarily on the grade-point average in philosophy. Performance in undergraduate seminars and in independent study is sometimes considered.

Philosophy is relevant to every program and concentration in the University. The basic problems it addresses are of perennial significance. Below are listed groups of courses that might be of particular relevance to students concentrating in other disciplines:

anthropology
PHL 102, 103, 105, 201, 202, 247, 252

biology, chemistry, geology, microbiology, physics and astronomy
PHL 110, 152, 252

computer science, mathematics
PHL 110, 210–219, 252

economics
PHL 102, 105, 110, 220, 223, 252

English, art and art history, modern languages and cultures
PHL 115, 141, 171, 201, 202, 247

history
PHL 201–202, 260–269

naval science
PHL 102, 110, 223, 252, 308

political science
PHL 102, 103, 110, 220–229, 252, 308

psychology and cognitive science
PHL 241–249, 348

religion
PHL 101–103, 111, 201, 202, 242, 268

REQUIREMENTS FOR CONCENTRATION IN PHILOSOPHY

A total of 10 courses:

1. PHL 110, 201, 202, 300

2. Six additional courses, meeting the following conditions:

a. At least three of the courses must be advanced courses in philosophy. Advanced courses are those numbered above PHL 202.

b. At least one of the courses must be in ethics (PHL 102, 103, 116, 118, 220–229, 308, 311).

c. At least one of the courses must be selected from either Logic and Related Courses (PHL 211–219), or Traditional

Philosophical Disciplines (PHL 240–249),
or Philosophy of Science (PHL 250–259).

d. At least one of the courses must be an advanced philosophy course designated with a "W," to indicate upper-level writing credit. These courses are available with the permission of the instructor.

PHILOSOPHY CONCENTRATION
WITH EMPHASIS ON
LAW AND ETHICS

A total of 10 courses:

1. PHL 110, 201, 202, 300

2. Six additional courses, meeting the following conditions:

a. At least three of the courses must be advanced courses in philosophy. Advanced courses are those numbered above PHL 202.

b. At least four of the courses must be in law, ethics, or reasoning (PHL 102–106, 116, 118, 220–229, 308, 311).

c. At least one of the courses must be selected from either Logic or Related Courses (PHL 211–219), or Traditional Philosophical Disciplines (PHL 240–249), or Philosophy of Science (PHL 250–259).

d. At least one of the courses must be an advanced philosophy course designated with a "W," to indicate upper-level writing credit. These courses are available with the permission of the instructor.

3. An advanced course in an allied field may be substituted for a philosophy course in requirement 2 above, with the permission of the philosophy department's undergraduate advisor.

PHILOSOPHY CONCENTRATION
WITH EMPHASIS ON HISTORY

A total of 10 courses:

1. PHL 110, 201, 202, 300

2. Six additional courses, meeting the following conditions:

a. At least three of the courses must be advanced courses in philosophy. Advanced courses are those numbered above PHL 202.

b. At least one of the courses must be in ethics (PHL 102, 103, 116, 118, 220–229, 308, 311).

c. At least one of the courses must be selected from either Logic and Related Courses (PHL 211–219), or Traditional Philosophical Disciplines (PHL 240–249), or Philosophy of Science (PHL 250–259).

d. At least three of the courses must be history of philosophy courses (PHL 260–269).

e. At least one of the courses must be an advanced philosophy course designated with a "W," to indicate upper-level writing credit. These courses are available with the permission of the instructor.

3. An advanced course in an allied field may be substituted for a philosophy course in requirement 2 above, with the permission of the philosophy department's undergraduate advisor.

PHILOSOPHY CONCENTRATION
WITH EMPHASIS ON LOGIC AND
THE PHILOSOPHY OF SCIENCE

A total of 10 courses:

1. PHL 110, 201, 202, 300

2. Six additional courses, meeting the following conditions:

a. At least three of the courses must be advanced courses in philosophy. Advanced courses are those numbered above PHL 202.

b. At least one of the courses must be in ethics (PHL 102, 103, 116, 118, 220–229, 308, 311).

c. At least three of the courses must be selected from either Logic (PHL 211–219) or Philosophy of Science (PHL 250–259).

d. At least one of the courses must be an advanced philosophy course designated with a "W," to indicate upper-level writing credit. These courses are available with the permission of the instructor.

3. An advanced course in an allied field may be substituted for a philosophy course in requirement 2 above, with the permission of the philosophy department's undergraduate advisor.

Ordinarily, a student who concentrates in both philosophy and some other discipline will take the advanced courses listed above that are recommended to students in that other discipline.

Qualified concentrators in philosophy may be approved by the department for the Study Abroad Program.

Students may minor in philosophy by following one of the four plans described below. There is a general minor in philosophy and specialized minors in philosophy of science, ethics, and history of philosophy. There is considerable flexibility in devising philosophy minors. Students formulate their programs in close consultation with the undergraduate advisor.

MINORS IN PHILOSOPHY

Each minor requires five courses. These should be chosen in consultation with the undergraduate advisor, but need not have a specific focus.

Plan A
PHILOSOPHY OF SCIENCE
PHL 110, 252, and three other courses in philosophy of science (PHL 105, 106, 218, 243, 244, 253, 352, 391).

Plan B
ETHICS
PHL 102 and four other courses in ethics and related areas (PHL 103, 116, 118, 220–229, 308, 311).

Plan C
HISTORY OF PHILOSOPHY
PHL 201 and 202 and three other courses in the history of philosophy (PHL 260–269, 315, 319, 320, 323, 370).

Plan D
PHILOSOPHY
Five courses in philosophy, chosen in consultation with the undergraduate advisor.

CLUSTERS

The department offers six clusters:
- Ethics and Values
- History of Philosophy
- Knowledge, Mind, and Nature
- Philosophy and Law
- Philosophy Teaching Internship
- Logic
- Non-Violence Studies

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

INTRODUCTORY COURSES

101. Introduction to Philosophy. A study of fundamental philosophical problems and approaches to their solution.
102. Ethics. A critical examination of leading theories of right and wrong, and good and evil.
103. Contemporary Moral Problems. The application of ethical theory to moral problems, such as punishment, abortion, and racism.
105. Reason and Argument. A study of reason and argument on both scientific and nonscientific topics. How to evaluate reasoning as it is found in editorials, speeches, and essays. How to understand and evaluate the reasoning found in reports on scientific research.
108. Philosophy of War. An examination of the concepts of war, legal and moral aspects of just war theory, pacifism, and the problem of war and moral responsibility.
110. Introductory Logic. Precise methods for formalizing arguments, demonstrating their validity, and proving theorems in first-order symbolic logic. Same as COG 110.
111. Philosophy of Religion. Same as REL 161.
115. Philosophy and Literature. A study of philosophical issues of morality, human action, and happiness.
116. Philosophy, History, and Practice of Non-Violence. Study of the origins and historical development of non-violence.
118. Business Ethics. A study of the applications of general moral theory to some of the more important moral problems arising in the areas of business and management.
141. Aesthetics. Critical examination of some of the major problems in aesthetics and consideration of the historical routes along which they have evolved. Same as AH 269.
145. Minds and Machines. A study of the nature of the mind and artificial intelligence.
152. Science and Reason. An introduction to basic questions which arise when one reflects on the nature of science and its development.
171. Philosophical Foundations of Feminism. The investigation of some of the philosophical issues raised by contemporary feminism, such as questions about justice, human nature, and human freedom. Same as WST 205.

HISTORICAL COURSES

201. History of Ancient Philosophy. Lecture survey of the development of Western philosophy from the prephilosophical beginnings through Aristotle. (Fall)

202. History of Modern Philosophy. A study of important philosophers from the seventeenth to the eighteenth century, and of their position in the cultural history of the West. (Spring)

261. Kant. A study of the philosophy of Immanuel Kant focusing on the *Critique of Pure Reason*. Prerequisite: PHL 202.

265. Selected Topics in Ancient Philosophy. Foundations of Ancient Greek philosophy from pre-Socratic to Hellenistic philosophers. Prerequisite: PHL 201 or permission of instructor.

266. Rationalism. A study of Descartes, Leibniz, and Spinoza, with emphasis on the last. Topics include the nature of substance, of space and time, and of knowledge and mind. Prerequisite: PHL 202.

267. British Empiricism. A study of three great figures of early British philosophy: Locke, Hume, and Reid. Topics include theories of knowledge, consciousness, space, and perception. Prerequisite: PHL 202.

268. Augustine, Anselm, and Aquinas. Same as REL 230.

LOGIC AND RELATED COURSES

214. Logical Methods in Philosophy. Philosophical logic: modal, tense, many-valued logic, logical linguistics, mereology, etc. Prerequisite: PHL 110 or permission of instructor.

216. Mathematical Logic. Same as MTH 216 and CSC 216. Prerequisite: PHL 110 or permission of the instructor.

217. Uncertain Inference. The exploration of various measures of uncertainty proposed in philosophy and computer science. Prerequisite: PHL 110 or permission of instructor. Same as COG 217 and CSC 217.

218. The Philosophy of Mathematics. A study of the nature of mathematics from a philosophical point of view. Prerequisite: PHL 110 or permission of the instructor.

219. Deviant Logic. This course is concerned with the study of "alternative" logics: logics in which more than two truth values are possible, logics in which not every statement has a truth value, logics that are designed to accommodate vagueness, logics that allow inconsistencies. Prerequisite: PHL 110 or PHL 210 or permission of the instructor.

ETHICS AND RELATED COURSES

220. Recent Ethical Theory. An examination of the main twentieth-century ethical and meta-ethical theories. Readings from Moore, Ross, Stevenson, Hare, et al. Prerequisite: PHL 102 or permission of the instructor.

221. Philosophical Foundations of American Revolution. A study of the philosophical foundations of the American Revolution by examining the political theory which lies behind the revolution and which underlies the foundations of the Constitution.

223. Social and Political Philosophy. An inquiry into the nature of human society, role of the state, and relation of moral to legal obligation. Prerequisite: PHL 102 or permission of the instructor.

224. History of Ethics. An examination of the major writers on ethics in Western thought, including Plato, Aristotle, Aurelius, Augustine, Hume, Kant, Mill, and Nietzsche. Prerequisite: one previous course in philosophy.

225. Ethical Decisions in Medicine. An examination of some of the troubling ethical issues associated with medicine, including the medical circumstances of conception and birth, medical enhancement of mental and physical abilities, and end-of-life issues.

226 Philosophy of Law. The nature of law and legal practice in relation to ethics. Prerequisite: one previous course in philosophy.

228. Public Health Ethics. An examination of the values of health, social needs, and freedom through a systematic examination of situations in which these conflicts arise. Prerequisite: one previous course in philosophy.

230. Environmental Justice. Considers environmental problems and the distribution of environmental resources and burdens from the standpoint of ethics and political philosophy. Prerequisite: one previous course in philosophy.

TRADITIONAL PHILOSOPHICAL DISCIPLINES

242. Metaphysics. The study of the nature of a person, the relations of mind and matter, and the existence of God. Prerequisite: one previous course in philosophy.

243. Theory of Knowledge. A study of the nature and extent of human knowledge. What is knowledge? Can skepticism be refuted? Under what conditions are beliefs justified or rational? Can anyone know what is right and wrong? Prerequisite: one previous course in philosophy.

244. Philosophy of Mind. A discussion of problems connected with the nature of mind, e.g., the mind/body problem and the problem of personal identity. Prerequisite: one previous course in philosophy.

247. Philosophy of Language. A study of philosophical questions about language and the general nature of language. Prerequisite: one previous course in philosophy.

PHILOSOPHY OF SCIENCE

251. Philosophy of Biology. This course is an introduction to philosophy of biology focusing on issues connected with the nature

and scope of biological explanations. Prerequisite: PHL 110 or permission of instructor.

252. Philosophy of Science. Examines the nature of scientific theories, theory confirmation, laws, explanation, and related topics. Prerequisite: PHL 110 or permission of instructor.

254. Philosophy of Cognitive Science. This course is an introduction to the philosophy of cognitive science. Possible topics include the structure of cognition; theories of mental representation; explanation and reduction in cognitive science; folk psychology and theory of mind; and evolutionary psychology.
Prerequisite: PHL 110 or permission of instructor.

SEMINARS

300. Seminar for Majors. Restrictions: open only to philosophy majors and minors.

308. Morality and War. An examination of the question whether war can be morally justified, with special attention to the just war theory, the killing of innocents, and nuclear deterrence. Prerequisite: one previous course in philosophy.

324. Rousseau to Revolution. A study of the political philosophy of Rousseau and the French Revolution. Prerequisite: one previous course in philosophy.

342. Metaphysics. A close examination of one or more topics from recent work in meta-physics, such as identity, essential properties, universals, possible worlds, and free will. Prerequisite: one previous course in philosophy.

348. Free Will. An investigation of recent proposed answers to the classical philosophical issues concerning free will. Prerequisite: one previous course in philosophy.

360. Selected Topics in the Philosophy of Religion. An examination of recent work in the philosophy of religion. Prerequisite: one previous course in philosophy.

391. Independent Study in Philosophy. The reading of philosophical literature under guidance, for seniors majoring in philosophy.

PHYSICS AND ASTRONOMY

Govind P. Agrawal, Ph.D. (Indian Institute of Technology, New Delhi) *Professor of Optics and of Physics and Senior Scientist in the Laboratory for Laser Energistics*

Riccardo Betti, Ph.D. (M.I.T.) *Professor of Mechanical Engineering and of Physics and Senior Scientist in the Laboratory for Laser Energetics*

Nicholas P. Bigelow, Ph.D. (Cornell) *Lee A. DuBridge Professor of Physics, Professor of Optics, and Senior Scientist in the Laboratory for Laser Energetics*

Eric G. Blackman, Ph.D. (Harvard) *Professor of Physics and Astronomy and Senior Scientist in the Laboratory for Laser Energetics*

Mark F. Bocko. Ph.D. (Rochester) *Professor of Electrical and Computer Engineering and of Physics*

Arie Bodek, Ph.D. (M.I.T.) *George E. Pake Professor of Physics and Professor of Physics*

Robert Boyd, Ph.D. (California, Berkeley)
M. Parker Givens Professor of Optics and Professor of Physics

Douglas Cline, Ph.D. (Manchester) *Professor of Physics*

Esther Conwell, Ph.D. (Chicago) *Professor (Research) of Chemistry and of Physics*

Ashok Das, Ph.D. (SUNY, Stony Brook)
Professor of Physics

Regina Demina, Ph.D. (Northeastern)
Professor of Physics

David H. Douglass, Jr., Ph.D. (M.I.T.)
Professor of Physics

Charles B. Duke, Ph.D. (Princeton) *Professor (Research) of Physics*

Joseph H. Eberly, Ph.D. (Stanford) *Andrew Carnegie Professor of Physics and Professor of Optics*

Thomas Ferbel, Ph.D. (Yale) *Professor of Physics*

Philippe M. Fauchet, Ph.D. (Stanford)
Distinguished Professor of Electrical and Computer Engineering, Professor of Materials Science, of Optics, of Physics, and of Biomedical Engineering and Senior Scientist in the Laboratory for Laser Energetics

William J. Forrest, Ph.D. (California, San Diego) *Professor of Astronomy; Director, C. E. Kenneth Mees Observatory*
Thomas H. Foster, Ph.D. (Rochester) *Professor of Imaging Sciences, of Optics, and of Physics*
Adam A. Frank, Ph.D. (Washington, Seattle) *Professor of Physics and Astronomy and Senior Scientist in the Laboratory for Laser Energetics*
Yongli Gao, Ph.D. (Purdue) *Professor of Physics*
Carl Richard Hagen, Ph.D. (M.I.T) *Professor of Physics*
Wayne H. Knox, Ph.D. (Rochester)
Professor of Optics and of Physics and Senior Scientist in the Laboratory for Laser Energetics
Robert L. McCrory, Ph.D. (M.I.T.) *Professor of Mechanical Engineering and of Physics and Astronomy and Senior Scientist in the Laboratory for Laser Energetics; Vice Provost and Director and CEO of the Laboratory for Laser Energetics*
Kevin S. McFarland, Ph.D. (Chicago)
Professor of Physics
Adrian C. Melissinos, Ph.D. (M.I.T.)
Professor of Physics
David D. Meyerhofer, Ph.D. (Princeton)
Professor of Mechanical Engineering and of Physics and Senior Scientist in the Laboratory for Laser Energetics and Director of the Experimental Division
Lukas Novotny, Dr. Sc. Techn. (Swiss Federal Institute of Technology)
Professor of Optics, of Physics, and of Biomedical Engineering, and Scientist in the Laboratory for Laser Energetics
Lynne Orr, Ph.D. (Chicago) *C. E. Kenneth Mees Professor and Professor of Physics*
Sarada G. Rajeev, Ph.D. (Syracuse) *Professor of Physics and of Mathematics*
Lewis Rothberg, Ph.D. (Harvard) *Professor of Chemistry, of Chemical Engineering, and of Physics*
Wolf-Udo Schröder, Ph.D. (Darmstadt)
Professor of Chemistry and of Physics
Yonathan Shapir, Ph.D. (Tel Aviv) *Professor of Physics and of Chemical Engineering, and of Mathematics*
Paul Slattery, Ph.D. (Yale) *Professor of Physics; Dean of Research*
Roman Sobolewski, Ph.D. (Polish Academy of Sciences) *Professor of Electrical and Computer Engineering and of Physics and Senior Scientists in the Laboratory for Laser Energetics*
Carlos R. Stroud, Jr., Ph.D. (Washington, St. Louis) *Professor of Optics and of Physics*
Ching W. Tang, Ph.D. (Cornell) *Doris Johns Cherry Professor of Chemical Engineering, Professor of Chemcial Engineering, of Chemistry, and of Physics*
John A. Tarduno, Ph.D. (Stanford) *Professor of Geophysics and of Physics*
Stephen L. Teitel, Ph.D. (Cornell) *Professor of Physics*
John H. Thomas, Ph.D. (Purdue) *Professor of Mechanical and Aerospace Sciences and of Astronomy*
Edward H. Thorndike, Ph.D. (Harvard)
Professor of Physics
Dan M. Watson, Ph.D. (California, Berkeley)
Professor of Physics and Astronomy
Emil Wolf, Ph.D. (Bristol), D.Sc. (Edinburgh)
Wilson Professor of Optical Physics and Professor of Optics
Frank L. H. Wolfs, Ph.D. (Chicago) *Professor of Physics*
Jianhui Zhong, Ph.D. (Brown) *Professor of Imaging Sciences, of Biomedical Engineering, and of Physics*
John C. Howell, Ph.D. (Pennsylvania State) *Associate Professor of Physics and Astronomy*
Steven Manly, Ph.D. (Columbia) *Associate Professor of Physics*
Alice Quillen, Ph.D. (California Institute of Technology) *Associate Professor of Physics and Astronomy*
Antonio Badolato, Ph.D. (California, Santa Barbara) *Assistant Professor of Physics*
Aran Garcia-Belido, Ph.D. (London)
Assistant Professor of Physics
Andrew Jordan, Ph.D. (California, Santa Barbara) *Assistant Professor of Physics*
Eric E. Mamajek, Ph.D. (Arizona)

Assistant Professor of Physics
Chuang Ren, Ph.D. (Wisconsin–Madison)
Assistant Professor of Mechanical Engineering and of Physics and Scientist in the Laboratory for Laser Energetics
Theodore Castner, Ph.D. (Illinois*) Professor Emeritus of Physics*
Harry E. Gove, Ph.D. (M.I.T.)
Professor Emeritus of Physics
H. Lawrence Helfer, Ph.D. (Chicago) *Professor Emeritus of Astronomy*
John Huizenga, Ph.D. (Illinois) *Tracy H. Harris Professor Emeritus of Chemistry and Professor Emeritus of Physics*
Edward H. Jacobsen, Ph.D. (M.I.T.) *Professor Emeritus of Physics*
Robert S. Knox, Ph.D. (Rochester) *Professor Emeritus of Physics and Senior Scientist in the Laboratory for Laser Energetics*
Daniel S. Koltun, Ph.D. (Princeton)
Professor Emeritus of Physics and Senior Scientist in the Laboratory for Laser Energetics
Susumu Okubo, Ph.D. (Rochester) *Professor Emeritus of Physics*
Judith L. Pipher, Ph.D. (Cornell) *Professor Emerita of Astronomy*
Malcolm P. Savedoff, Ph.D. (Princeton)
Professor Emeritus of Astronomy
Stewart Sharpless, Ph.D. (Chicago) *Professor Emeritus of Astronomy*
Albert Simon, Ph.D. (Rochester) *Professor Emeritus of Mechanical Engineering and of Physics and Senior Scientist in the Laboratory for Laser Energetics*
Robert L. Sproull, Ph.D. (Cornell) *Professor Emeritus of Physics*
Hugh Van Horn, Ph.D. (Cornell) *Professor Emeritus of Physics and Astronomy*

Approximately 25 graduate teaching fellows and several carefully selected undergraduates assist the faculty in the presentation of the teaching program.

The Department of Physics and Astronomy provides a spectrum of opportunities for undergraduates, ranging from introductory courses for the nonscientist to a minor in physics or astronomy and complete degree programs leading to the B.A. and B.S. in physics or astronomy (astrophysics). The graduate program offers advanced courses that are open to undergraduates seeking in-depth study.

In accord with College policy, students are not formally accepted as concentrators until the end of their sophomore year. However, first- or second-year students wishing to major in physics or in physics and astronomy should alert the department's Office of Undergraduate Studies, to be assigned a departmental advisor.

The department awards several prizes in recognition of special achievement. The Honors Physics Prize is presented annually to the student with the best record in PHY 142, 143, and 237. The Stoddard Prize is awarded for the best senior thesis. The Fulbright Prize is awarded for the best performance in Advanced Laboratory. The John F. Flagg Award is given annually to the graduating senior who has compiled the best academic record in undergraduate courses. A complete description of the requirements for these prizes is available at the department's Office of Undergraduate Studies, 211 Bausch & Lomb Hall.

GENERAL COURSE INFORMATION

Of particular interest to students not concentrating in the natural sciences are PHY 100, 103, AST 102, 104, 105. These provide either broad surveys or are focused on selected topics, but do not require any special background. Students with interest in science and music will find PHY 103 highly appropriate. For those desiring a working knowledge of basic physics, PHY 113, 114 or 121, 122, 123 are appropriate, the latter requiring a background in high school science and mathematics, as does AST 111, on the solar system. AST 142, a survey of astrophysics, is designed for the physical science major with background in general physics. The sequence PHY 141, 142, 143 is recommended for all students with interest and abilities in physics, and is most appropriate for those wishing to major in the department. A student who does well in the PHY 121, 122, 123 sequence should be equally well prepared to pursue one of the department's degree programs.

Based on scores on the Advanced Placement Test, or the equivalent (and an interview), students can enter the department degree programs with advanced standing.

CONCENTRATION IN PHYSICS

The B.A. program is appropriate for students desiring a broad academic experience. It also provides greater flexibility when planning a joint degree with another department. The B.S. degree in physics is intensive and provides stronger preparation for graduate school in physics or a closely related science. Students planning to pursue graduate study normally elect the B.S. program; they are strongly encouraged to take advantage of opportunities for independent reading or research provided by PHY 391, 393, and 395.

GENERAL REQUIREMENTS (PHYSICS)

Preparation for concentration in physics is similar for students interested either in B.A. or B.S. degrees:

- PHY 121 or 141 (Honors), 122 or 142 (Honors), and 123 or 143 (Honors).
- Four semesters of mathematics: MTH 161, 162, 164, 165 (or their close equivalents)
- For the B.S. program, one introductory course in the natural sciences, other than in physics or mathematics. This should be completed within the first two years.

The B.A. and B.S. programs of study should be planned by the student in consultation with the departmental advisor before the end of the sophomore year, and require departmental approval.

B.A. PROGRAM (PHYSICS)

Requirements beyond the first two years

- PHY 217, 235W, 237; one additional course chosen from among the following: PHY 218, 227, 243W, 246.
- An additional 4 credit hours of approved 200- or 300-level physics and/or astronomy courses.
- Eight additional credit hours (usually two 4-credit hour courses), which can be approved 200- or 300-level physics and/or astronomy courses, 200-level mathematics courses, or other science or engineering courses (not necessarily at the 200 level). Because MTH 281 and/or 282 is required for many of the 200-level physics courses, the options are more restrictive than they seem.
- All course choices must be approved by the undergraduate physics advisor.

B.S. PROGRAM (PHYSICS)

Requirements beyond the first two years

- PHY 217, 218, 227, 235W, 237, 246 (or their close equivalents); PHY 243W or 244W; an additional 4 credit hours of approved 200- or 300-level physics and/or astronomy courses.
- Two advanced courses in mathematics (MTH 281 is required; MTH 282 is recommended).
- Computer literacy. This requirement can be satisfied by receiving a passing grade in an introductory computing course or in PHY 256 (Computational Physics), by completing a computer-based problem approved by the department's undergraduate advisor (possibly one associated with a previous class), or by having a faculty member familiar with the students' work certify the computer literacy.
- All course choices must be approved by the undergraduate physics advisor.

Students with a prior knowledge of basic physics and differential and integral calculus should take PHY 141 and 143 in their freshman year and PHY 142 in their sophomore year; others should take PHY 121 in the spring of their freshman year and PHY 122 and 123 in their sophomore year. A synopsis of a typical program for the B.S. in physics follows:

First Year

PHY 141	PHY 143
MTH 161	MTH 162
CAS 105	Elective
Elective	Elective

Second Year

PHY 142	PHY 237		
MTH 164	MTH 165	Elective	Elective
Elective	Elective		

Third Year

PHY 217	PHY 218
PHY 235W	PHY 227
MTH 281	MTH 282
Elective	Elective

Fourth Year

PHY 243W	PHY 246
PHY or AST elective	Elective
Elective	Elective
Elective	Elective

REQUIREMENTS FOR A MINOR IN PHYSICS

- An introductory physics sequence: PHY 121 or 141 (Honors), 122 or 142 (Honors), and 123 or 143 (Honors).

- Four semesters of mathematics: MTH 161, 162, 164, 165 (or their close equivalents).
- Any three of the following courses: PHY 217, 218, 227, 235W, 237, 243W, 244W, 245W, 246, 250, 251, 252, 253, 254, and 256.
- All course choices must be approved by the undergraduate physics advisor. The advisor will be concerned with the general coherence of the program, the student's plans to take any prerequisites, and mutual reinforcements between the minor and the student's major studies.

For admission to the minor, a student must have attained a C average in both the introductory physics sequence and the introductory mathematics courses that are prerequisites for the introductory physics courses.

CONCENTRATION IN PHYSICS AND ASTRONOMY

The programs leading to the B.A. and B.S. degrees in physics and astronomy are effectively double degree programs. Students planning to pursue graduate study should elect the B.S. program; they are encouraged to take advantage of opportunities for reading or research provided by AST 391 and 393 in the senior year. The program as described below can be modified to fulfill the student's academic goals.

Approval from the astronomy advisor is required for all proposed programs. The 200-level astronomy courses are offered in a two-year cycle.

GENERAL REQUIREMENTS (PHYSICS AND ASTRONOMY)

Requirements for the first two years are the same as those for the B.A. and B.S. in physics, except that AST 111 and 142 are normally taken in place of the electives in the first two years.

Background knowledge equivalent to that contained in AST 111 and 142 is needed for completion of the degrees (AST 142 is recommended).

B.A. PROGRAM (PHYSICS AND ASTRONOMY—ASTROPHYSICS)

Requirements beyond the first two years

- Two of the following courses: AST 231, 232, 241, or 242. One of the courses selected must be AST 241 or 242.
- Three additional 200-level physics or astronomy courses. Two of the three courses must be selected from the following list: PHY 217, 227, 235W, 237.
- Two additional 200-level technical courses, which can be in physics, mathematics, or another science or engineering. Some engineering courses at the 100-level may also be acceptable, with prior approval from the undergraduate astronomy advisor.
- At least a 2.0 (C) average in astronomy, physics, and mathematics courses must be maintained.
- All course choices must be approved by the undergraduate astronomy advisor.

B.S. PROGRAM (PHYSICS AND ASTRONOMY—ASTROPHYSICS)

Requirements beyond the first two years

- Three of the following courses: AST 231, 232**,** 241, or 242.
- A total of six courses in physics at the 200 level or beyond: PHY 217, 218, 227, 235W, 237, 243W, 246, 250 (or close equivalents), or AST 393W (Senior Thesis). PHY 218 and 243W are recommended.
- Two courses in advanced mathematics: MTH 281 and 282 are recommended.
- All course choices must be approved by the undergraduate astronomy advisor.

Students with a prior knowledge of basic physics and differential and integral calculus should take PHY 141 and 143 in their freshman year and PHY 142 in their sophomore year; others should take PHY 121 in the spring of their freshman year and PHY 122 and 123 in their sophomore year. A synopsis of a typical program for the B.S. in physics and astronomy follows:

First Year

PHY 141	PHY 143
MTH 161	MTH 162
CAS 105	Elective
AST 111	Elective

Second Year

PHY 142	PHY 237	
MTH 164	MTH 165	Elective AST 142

Elective	Elective
Third Year	
PHY 217	PHY 218
PHY 235W	PHY 227
MTH 281	MTH 282
AST 232	Elective
Fourth Year	
PHY 243W	AST 242
AST 231	Elective
Elective	Elective
Elective	Elective

REQUIREMENTS FOR
A MINOR IN ASTRONOMY

- An introductory physics sequence: PHY 121 or 141 (Honors), 122 or 142 (Honors), and 123 or 143 (Honors).
- Four semesters of mathematics: MTH 161, 162, 164, 165 (or their close equivalents).
- One of three descriptive astronomy courses: AST 102, 104, 105, or 111; AST 111 is preferred.
- The introductory astrophysics course: AST 142.
- Two 200-level astronomy courses. (Four of these are offered on a two-year cycle. These courses usually require concurrent or prerequisite registration in 200-level mathematics and physics courses.)
- All course choices must be approved by the undergraduate astronomy advisor.

For admission to the minor, a student must have attained a C average in the introductory 100-level astronomy courses, and a C average in the introductory physics and mathematics courses.

Concentrators in physics can minor in
astronomy.

REQUIREMENTS FOR A CERTIFICATE IN BIOLOGICAL, MEDICAL, OR BIOLOGICAL AND MEDICAL PHYSICS

In order to be eligible for a Certificate in Biological or Medical Physics, a student must be approved by the Certificate committee and obtain at least a C+ in each of the following seven courses:

PHY 235 and 237 and one of the following courses: PHY 217, 262, or 227

- One of following courses: MTH 281 or 282
- One of following courses: BIO 110, 111, or 198
- One of following courses: CHM 131, 132, 171Q, 232, or 252
- One or two advanced courses in biological and/or medical physics, e.g., PHY 252 or 253

REQUIREMENTS FOR A CITATION FOR ACHIEVEMENT IN COLLEGE LEADERSHIP

The Department of Physics and Astronomy courses for this program are listed below. More information may be found on page 16 of this bulletin.

- PHY 386—Teaching Internship I, Pedagogy Training and a workshop leader for one of the following courses: PHY 113, 122, 141, or 142.
- PHY 387—Teaching Internship II, Pedagogy and Group Leadership and a workshop leader for one of the following courses: PHY 114, 121, 123, 143.
- PHY 390A—Supervised Teaching with Leadership Focus and a workshop leader from one of the courses listed above as long as not a repeat. Prerequisites: PHY 386 and 387.

B.S.-M.S. PROGRAM IN PHYSICS AND IN PHYSICS AND ASTRONOMY

Physics and astronomy students who wish to go beyond the bachelor's level may enroll in the department's five-year general B.A./B.S. option in physics with an M.S. in any subfield physics program. Students are encouraged to apply to a 3-2 program in the spring of the junior year and can begin graduate-level work in the fourth year. The B.S. is ordinarily completed by the end of the fourth year, and requirements for the M.S. are completed by the end of the fifth year. The M.S. degree may be pursued via plan A (with master's thesis) or plan B (with comprehensive exam). Some financial assistance may be available during the fifth year. Further details and program requirements can be obtained from the department's Office of Graduate Studies.

UPPER-LEVEL WRITING REQUIREMENT

Students must fulfill the upper-level writing requirement and can do so by taking two upper-level writing courses within the department. In particular, AST 231W, 232W, PHY 235W, 243W, 244W, and 391W, 393W, 395W, in both physics and astronomy can be used for such purpose. This issue should be discussed with the undergraduate advisor.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

PHYSICS

100. The Nature of the Physical World. This is an introductory course designed especially for students in the humanities and other nonscientific fields who are interested in learning something about the physical world in perspective. Topics include the scale of the universe from galaxies to atoms and quarks; the fundamental forces of nature, motion and relativity, energy, electromagnetism and its everyday applications; the structure of matter, atoms, light, and quantum mechanics. There are no prerequisites, no background knowledge is required, and the material is presented essentially without mathematics. Substantial use is made of demonstrations and movies. (Fall and Spring)

103. Physics of Music. A study of the physical basis of musical phenomena with a focus on demonstration and experimentation. Theories of musical instruments' acoustics, spectral analysis, room acoustics, and special topics selected by the class and instructor. One lecture and one lab per week.Time in lab at the end of the semester is devoted to individual projects, often involving construction and analysis of students' instruments. The course is open to any student with a strong interest in both science and music. (Fall)

113. General Physics I. First semester of a two-course sequence suitable for students in the life sciences. Newtonian particle mechanics: Newton's laws and their applications to straight-line and circular motion; energy; linear momentum; angular momentum; harmonic motion; Kepler's laws; planetary and satellite motion. Calculus used and introduced as needed. In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration. Workshop/recitation times are determined by the instructor. Prerequisite: MTH 141 or 161 (may be taken concurrently). (Fall and Summer I)

114. General Physics II. Second semester of a two-course sequence suitable for students in the life sciences. Electricity and magnetism, optics, electromagnetic waves, and modern physics (introduction to relativity, quantum physics, etc.). In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration. Prerequisites: PHY 113; MTH 142–143, or 162 (may be taken concurrently). (Spring and Summer II)

121. Mechanics. First semester of a three-course sequence for students intending to major in physics, other physical sciences, and engineering. Motion in one and two dimensions, Newton's laws, work and energy, conservation of energy, systems of particles, rotations, oscillations, gravity, thermodynamics. In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required.
Students are required to register for a laboratory and workshop/recitation section at the time of course registration. -Prerequisite: MTH 141 or 161 (may be taken concurrently); prior knowledge of introductory calculus (simple integration and differentiation). (Spring and Summer I)

122. Electricity and Magnetism. Second semester of a three-course sequence for students intending to major in physics, other physical sciences, and engineering. Coulomb's Law through Maxwell's equations, electrostatics, electrical potential, capacitors, electric fields in matter, current and circuits, magnetostatics, magnetic fields in matter, induction, AC circuits, electromagnetic waves. In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration. Prerequisites: PHY 121; MTH 143 or 162 (may be taken concurrently). (Fall,
Summer II)

123. Waves and Modern Physics. Third semester of a three-course sequence for students intending to major in physics, other physical sciences, and engineering. Wave motion, physical optics, special relativity, photoelectric effect, Compton effect, X-rays, wave properties of particles. Schrödinger's equation applied to a particle in a box, penetration of a barrier, the hydrogen atom, the harmonic oscillator, the uncertainty principle, Rutherford scattering, the time-dependent Schrödinger equation and radioactive transitions, many electron atoms and molecules, statistical mechanics and selected topics in solid-state physics, nuclear physics, and particle physics. In addition to two 75-minute lectures each week, one workshop each week, and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration. Prerequisites: PHY 121–122; MTH 163 or 165 (may be taken concurrently). (Spring and Summer II)

141. Mechanics (Honors). First semester of a three-course honors sequence (PHY 141, 143, 142) recommended for prospective departmental concentrators and other science or engineering students with a strong interest in physics and mathematics. Topics are the same as those in PHY 121 but in greater depth. Motion in one and two dimensions, Newton's laws, work and energy, conservation of en-

ergy, systems of particles, rotations, oscillations, gravity, thermodynamics. In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration. Prerequisite: MTH 161 or 171 (may be taken concurrently); prior knowledge of introductory calculus
(simple integration and differentiation). (Fall)

142. Electricity and Magnetism (Honors). Third semester of a three-course honors sequence (PHY 141, 143, 142) recommended for prospective departmental concentrators and other science or engineering students with a strong interest in physics and mathematics. Topics are the same as those in PHY 122 but in greater depth. These topics include Coulomb's Law through Maxwell's equations, electrostatics, electrical potential, capacitors, electric fields in matter, current and circuits, magnetostatics, magnetic fields in matter, induction, AC circuits, waves. In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration. Prerequisites: performance at or above the B+ level in PHY 121; MTH 162 or 172 (may be taken concurrently). (Fall)

143. Waves and Modern Physics (Honors). Second semester of a three-course honors sequence (PHY 141, 143, 142), recommended for prospective departmental concentrators and other science or engineering students with a strong interest in physics and mathematics. Topics are the same as those in PHY 123 but in greater depth. Introductory examinations of Bohr's atomic model, de Broglie waves, momentum and energy quantization, Heisenberg's uncertainty relation, Schrödinger's cat, electron spin, photon interference, and Bell's inequalities; selected applications to solid-state, nuclear, particle, and astrophysics. In addition to two 75-minute lectures each week, one workshop each week and one three-hour laboratory every other week are required. Students are required to register for a laboratory and workshop/recitation section at the time of course registration.Prerequisites: PHY 141; MTH 162 or 172 (may be taken concurrently). Open to freshmen only. (Spring)

181. Mechanics Laboratory. Laboratory experiments in mechanics: statistics and measurement, acceleration of gravity, conservation of energy and momentum, moment of inertia and oscillations, and mechanical equivalent of heat. Prerequisites: for transfer students who have taken a course equivalent to PHY 113 or 121 but have not taken the labs. (Fall and Spring)

182. Electromagnetism Laboratory. Laboratory experiments in electricity and magnetism: Coulomb's Law, electric fields, measurement of the absolute volt, and capacitance, e/m of the electron, superconductivity, and electric circuits. Prerequisites: for transfer students who have taken a course equivalent to PHY 122 but have not taken the labs. (Fall)

183. Modern Physics Laboratory. Laboratory experiments in modern physics: velocity of sound, geometrical optics and imaging, the wave nature of light and microwaves, the spectrum of atomic hydrogen, and the Frank Hertz experiment. Prerequisites: for transfer students who have taken a course equivalent to PHY 123 but have not taken the labs. (Spring)

184. Experiments in Electricity,
Magnetism, and Modern Physics.
Laboratory experiments in electricity, magnetism, and modern physics: Coulomb's Law, electric fields, e/m ratio of the electron, superconductivity, electric circuits, geometrical optics and imaging, the wave nature of light, and the spectrum of atomic hydrogen. Prerequisites: for transfer students who have taken a course equivalent to PHY 114 but have not taken the labs. (Spring)

217. Electricity and Magnetism I.
Review of vector calculus; electrostatic field and potential; boundary value problems solved with orthogonal functions; the multipole expansion and dielectrics; the magnetic field and vector potential. Prerequisites: PHY 122 or 142; MTH 281 (may be taken concurrently). (Fall)

218. Electricity and Magnetism II. Electromagnetic induction; displacement current; Maxwell's equations; the wave equation; plane electromagnetic waves; Poynting vector; reflection and refraction; radiation; waveguides; transmission lines; propagation of light; radiation by charged particles; relativistic formulation of Maxwell's equations. Prerequisite: PHY 217. (Spring)

227. Thermodynamics and Statistical Mechanics. Multiplicity of physical states, thermal equilibrium, entropy and temperature, Boltzmann factor and partition function, statistical approach to free energy, chemical potential, distribution functions for ideal classical and quantum gases, applications to chemical reactions, thermal engines, equations of state and phase transitions. Prerequisites: PHY 237 MTH 281 or ME 201 (may be taken concurrently). (Spring)

235W. Classical Mechanics. Review of elementary mechanics; central force problems; conservation theorems and applications; Fourier and Green's functions; variational calculus and Lagrange multipliers; Lagrangian and Hamiltonian formulation of mechanics is introduced and applied; oscillations; normal mode theory; rigid body dynamics. The course is designed to satisfy part of the upper-level writing requirement. Prerequisites: PHY 121/ 141; MTH 281 or ME 201 (may be taken concurrently).

237. Quantum Mechanics of Physical Systems. Introduction to quantum mechanics with emphasis on applications to physical systems. Includes Schrödinger's theory and the one-dimensional Schrödinger's equation, the hydrogen atom, and selected applications from atomic and molecular physics, quantum statistics, lasers, solids, nuclei, and elementary
particles. Prerequisites: PHY 122/142, 123/143; MTH 165/174 (may be taken concurrently). (Spring)

243W. Advanced Experimental Techniques I. Students work in pairs and each team is expected to perform three or four experiments from a variety of available setups such as Berry's phase with light, universal chaos, lifetime of cosmic ray muons, optical pumping, electron diffractions, etc. This is a hands-on laboratory with most experiments under computer control. This course can be

used to satisfy part of the upper-level writing requirement. Prerequisites: PHY 217, 237, MTH 164 (may be taken concurrently). (Fall)

244W. Advanced Experimental Techniques II. A continuation of PHY 243W with greater emphasis on independent research and construction of more complicated instrumentation. This course can be used to satisfy part of the upper-level writing requirement. Prerequisites: PHY 217, 237, MTH 164 (may be taken concurrently). (Fall)

245W. Advanced Experimental Techniques in Nuclear, Particle, and Electron Spin Resonance. Similar to PHY 243W, except with experiments that have applications in medical physics. The four experiments are Lifetime of Muon, Electron Spin Resonance/Magnetic Resonance Imaging, Frank Hertz Experiment or Hall Effect, and Nuclear Spectroscopy. This course can be used to satisfy part of the upper-level writing requirement.

246. Quantum Theory. Formalism of quantum theory with more advanced applications than PHY 237. Includes postulates of quan-tum mechanics; function spaces, Hermitian operators, completeness of basis sets; superposition, compatible observables, conservation theorems; operations in abstract vector space, spin and angular momentum matrices; addition of angular momentum; perturbation theory, and simple scattering theory. Prerequisites: PHY 237; MTH 281 (or equivalent). (Spring)

250. Advanced Laboratory Project. Similar in level to PHY 243 and 244, but based on extended experimental projects by students as individuals or in small groups. The projects, chosen by mutual agreement between the students concerned and the professor, are intended to provide experience with the concepts and techniques of modem experimental research work. A particular project may be selected from almost any area of modern physics, but it should be strongly interesting to the student. Prerequisites: PHY 243W or 244W. (Fall and Spring)

251. Introduction to Condensed Matter Physics. An emphasis on the wide variety of phenomena that form the basis for modern solid-state devices. Topics include crystals, lattice vibrations, quantum mechanics of electrons in solids, energy band structure, semiconductors, superconductors, dielectrics, and magnets. Prerequisites: PHY 217, 227, 237. (Fall)

252. Biomedical Ultrasound. This course provides analyses of the physical bases for the use of high-frequency sound in medicine (diagnosis, therapy, and surgery) and biology. Topics include acoustic interactions of ultrasound with gas bodies (acoustic cavitation and contrast agents), thermal and nonthermal biological effects of ultrasound, ultrasonography, dosimetry, hyperthermia, and lithotripsy. Prerequisite: MTH 163, 164, PHY 122, 142, or permission of instructor. Cross-listed with BME 251/451.

253. Biological Physics. The course is designed for students of physical science or engineering background who are interested in biological and medical physics. Topics include fundamentals of biological physics, diffusive motion in biological system, thermal equilibrium and steady state, forces and energetics in biology, biochemical reaction, corporative transitions, biological membranes, neural system, and biophysical techniques. The materials are presented at the level of Nelson's *Biological Physics*. Prerequisites: PHY 121–123 or PHY 141–143.

254. Twentieth-Century Particle Physics. This course is designed for students interested in nuclear and particle physics. The course describes the properties of nuclei and various models used to describe nuclear matter, including the liquid drop model, shell model, collective model, radioactivity, fission, and fusion. Properties of particle interactions with matter are covered and used to describe the principles of detection used in nuclear and particle experiments, In addition, the principle of operation of various existing accelerators is discussed. Finally, the fundamental interactions of elementary particles and their constants are reviewed, with emphasis on conservation of quantum numbers and symmetries observed in high-energy collisions. Prerequisites: PHY 237.

256. Computational Physics. Introduction to numerical and computational methods, with special emphasis on their utilities and applications in contemporary physics topics. Topics covered include introduction of programming, numerical considerations, ordinary and partial differential equations, data analysis, random numbers, fractal growth, Monte Carlo methods. Prerequisites: PHY 121–123 or 141–143. (Spring)

261. Interference and Diffraction. See OPT 261.

262. Electromagnetic Theory. See OPT 262.

263. Computational Methods in Optics. See OPT 211.

264. Laser Systems. See OPT 224.

276. Medical Optics. Same as OPT 476.

311A. Mechanics and Chaotic Dynamics. This course is offered the first six weeks of the semester to upper-level undergraduates. Topics covered are Lagrangian and Hamiltonian dynamics, canonical transformations, Hamilton-Jacobi equations, chaotic dynamics and routes to chaos, Fourier spectrum and Poincaré maps, Lyapunov exponents, strange attractors and fractal dimensions, information dimension and Kolmogorov entropy, numerical tests for chaotic behavior. Prerequisites: PHY 235, permission of instructor. Same as PHY 411.

321A. Condensed Matter Physics I. Credit—2 hours. This course is a 2-credit version of the corresponding graduate-level course PHY 521. Prerequisite: permission of instructor.

322A. Introduction to Data Acquisition in the Physics Laboratory. Introduction to computer control, interfacing, and data acquisition in the laboratory. Topics include introduction to digital electronics, interface devices, data conversion devices, A/D converters, I/O ports, interface standards, microprocessor basics, introduction to P-Basic, and applications of microprocessor with PC.

No previous experience with computers expected. Prerequisites: PHY 121–123 or 141–143; MTH 161–164.

325. Physics of Radiotherapy I. Use of directly and indirectly ionizing radiation in radiation therapy causing biological damage in the normal tissue and cancer. Radiation delivery techniques are specifically designed and configured to target the neoplasm. The physics of radiation interactions with matter and the clinical use of radiation are presented. The methods of radiation production, measurement of ionizing radiation, absorbed dose as well as the calculation of dose distributions and treatment-planning systems are presented for all radiation modalities. Radiological physics is covered to the extent necessary to explain the use of CT, MR, and PET images as implemented in the treatment planning process. Radiation protection and quality assurance are topics presented at the end of the academic year. This course is open only to physics students who plan to earn a certificate in either biological or medical physics or students who are in the B.S./M.S. physics 3-2 program and plan to do an M.S. thesis in medical physics. Prerequisite: permission of instructor. Same as PHY 465.

326. Physics of Radiotherapy II. Use of directly and indirectly ionizing radiation in radiation therapy causing biological damage in the normal tissue and cancer. Radiation delivery techniques are specifically designed and configured to target the neoplasm. The physics of radiation interactions with matter and the clinical use of radiation are presented. The methods of radiation production, measurement of ionizing radiation, absorbed dose as well as the calculation of dose distributions and treatment-planning systems are presented for all radiation modalities. Radiological physics is covered to the extent necessary to explain the use of CT, MR, and PET images as implemented in the treatment planning proc- ess. Radiation protection and quality assurance are topics presented at the end of the academic year. This course is open only to physics students who plan to earn a certificate in either biological or medical physics or students who are in the B.S./M.S. physics 3-2 program and plan to do an M.S. thesis in medical physics. Prerequisite: permission of instructor. Same as PHY 466.

327. Physics of Radiobiology I. This course evaluates the effects of radiation in mammalian cell systems ranging from cell cultures to whole animals. Emphasis is on the application of radiobiological principles to radiotherapy practices in the clinical treatment of cancer. Topics include mechanism of radiation damage and repair, cell cycle effects, influence of oxygen, and tumor versus normal tissue effects of radition. This is similar to the course (same material, different problems for physics students) taken by oncology residents and is taught in the Radiation Oncology/ Cancer Center. Prerequisite: permission of instructor. Same as PHY 467.

328. Physics of Radiobiology II. This course evaluates the effects of radiation in mammalian cell systems ranging from cell cultures to whole animals. Emphasis is on the application of radiobiological principles to radiotherapy practices in the clinical treatment of cancer. Topics include mechanism of radiation damage and repair, cell cycle effects, influence of oxygen, and tumor versus normal tissue effects of radiation. This is similar to the course (same material, different problems for physics students) taken by oncology residents and is taught in the Radiation Oncology/ Cancer Center. Prerequisite: permission of instructor. Same as PHY 468.

331A. Introduction to Quantum Optics. Credit—2 hours. This course is a 2-credit version of the corresponding graduate-level course PHY 531/OPT 551. Prerequisite: permission of instructor.

354. Cosmology. Introduction to cosmology, covering the following broad topics: introduction to the universe, introduction to general relativity, cosmological models and the Fridemann-Walker universe, and thermodynamics of the early universe. This course consists of the first half of AST 554/PHY 554.

381A. Particle Physics I. Credit—2 hours. This course is a 2-credit version of the corresponding graduate-level course PHY 581. Prerequisite: permission of instructor.

382A. Particle Physics II. Credit—2 hours. This course is a 2-credit version of the corresponding graduate-level course PHY 582.

383. Special Topics in Physics. Course on selected topics in physics, offered when justified by sufficient interest. Prerequisite: permission of instructor.

383A. Special Topics in Physics. Credit—2 hours. Course on selected topics in physics, offered when justified by sufficient interest. Prerequisite: permission of instructor.

386. Teaching Internship I, Pedagogy Training. This course is designed for an undergraduate planning to be a workshop leader teaching intern (TI) and can be taken by a laboratory or recitation teaching intern (TI) who plans to use this experience to fulfill part of the requirements for the Citation for Achievement in College Leadership. Typically, the TI attends the weekly workshop leader training meeting that offers specialized support and training in group dynamics, learning theory, and science pedagogy for students facilitating collaborative learning groups for science and social science courses. The TI teaches one workshop, laboratory, or recitation in the fall semester introductory physics courses: PHY 113, 122, 141, or 142. Additional requirements are attendance at the weekly content meetings with a supervising professor, giving feedback to other leaders in a constructive evaluation process, and a project designed in concert with the supervising professor and the PHY 386 instructor. Course is similar to CAS 352.

387. Teaching Internship II, Pedagogy and Group Leadership. This course is designed for an undergraduate planning to be a workshop leader teaching intern (TI) and can be taken by a laboratory or recitation teaching intern (TI) who plans to use this experience to fulfill part of the requirements for the Citation for Achievement in College Leadership. Typically, the TI attends the weekly workshop leader training meeting that offers specialized support and training in group dynamics, learning theory, and science peda-

gogy for students facilitating collaborative learning groups for science and social science courses. The TI teaches one workshop, laboratory, or recitation in the spring semester introductory physics courses: PHY 113, 122, 141, or 142. Additional requirements are attendance at the weekly content meetings with a supervising professor, giving feedback to other leaders in a constructive evaluation process, and a project designed in concert with the supervising professor and the PHY 386 instructor. Course is similar to CAS 352.

388/389. Teaching Internship I.
The student typically spends one or two semesters teaching an introductory physics laboratory section, working with a graduate TA. Faculty supervision is augmented by training, ongoing teaching seminars, and a constructive evaluation process. Prerequisite: permission of instructor. (Fall and Spring)

389. Teaching Internship II. The student typically spends one or two semesters teaching an introductory physics laboratory section, working with a graduate TA. Faculty supervision is augmented by training, ongoing teaching seminars, and a constructive evaluation process. Prerequisite: permission of instructor. (Fall and Spring)

390. Supervised Teaching of Physics. Credit—2 hours. Introduction to the techniques of physics instruction, active observation, and participation in the teaching of an undergraduate course under the guidance of a faculty member. Prerequisites: permission of department and instructor. (Fall, Spring, and Summer)

390A. Supervised Teaching with Leadership Focus. This course is designed for an experienced undergraduate planning to be a workshop leader, laboratory or recitation teaching intern (TI) who is planning to use this experience to fulfill part of the requirements for the Citation for Achievement in College Leadership. The TI is expected to attend the weekly leader training meetings supporting PHY 386–387. In recognition of the student's experience, the TI takes on some mentoring and course organizational tasks. Students spend the semester teaching one workshop, laboratory, or recitation section during the fall/spring semester introductory physics courses: PHY 113, 114, 121, 122, 123, 141, 142, and 143. Additional requirements are attendance at weekly content meetings with a supervising professor and giving feedback to other leaders in a constructive evaluation process. An additional project is required which may or may not coincide with the mentoring and course organizational tasks mentioned above. This course may be taken more than once.

391. Independent Study. Independent study project under the direction of a faculty member of the Department of Physics and Astronomy. (Fall, Spring, and Summer)

391W. Independent Study. Independent study project under the direction of a faculty member of the Department of Physics and Astronomy. This course includes a writing component and can be used to satisfy part of the upper-level writing requirement. (Fall, Spring, and Summer)

393. Senior Project. Completion of an independent research project under the
direction of a faculty member of the Department of Physics and Astronomy. (Fall, Spring, and Summer)

393W. Senior Thesis. Completion of an independent research project under the direction of a faculty member of the Department of Physics and Astronomy. This course includes a writing component and can be used to satisfy part of the upper-level writing requirement. (Fall, Spring, and Summer)

395. Independent Research. Independent research project under the direction of a faculty member of the Department of Physics and Astronomy. (Fall, Spring, and Summer)

395W. Independent Research. Independent research project under the direction of a faculty member of the Department of Physics and Astronomy. This course includes a writing component and can be used to satisfy part of the upper-level writing requirement. (Fall, Spring, and Summer)

GRADUATE PHYSICS

Many graduate courses in physics and astronomy are available as 2-credit hour "half-courses" at a level appropriate for undergraduates.

401. Mathematical Methods in Optics and Physics. Sets, sequences, series. Contour integrals, residues, singularities. Ordinary differential equations, singularities. Sturm-Liouville operator, Green's functions. Classification of partial differential equations. Separation of variables. Prerequisites: MTH 164, 282 or equivalent.

402. Probability. Combinatorial. Random variables, moments, generating functions. Various probability distributions. Markov chains.

404. Linear Spaces. Vector, Banach, Hilbert spaces. Linear operators, Lebesque integral. Integral equations. Spectra. Prerequisites: MTH 235 or equivalent.

405. Geometric Methods of Physics. Topological spaces. Manifolds. Vectors and Tensors. Lie groups. Riemannian Manifolds. Applications. Prerequisites: MTH 243 or equivalent.

406. Symmetries in Physics. Finite groups. Compact and non-compact Lie groups and Lie algebras. Group representation theory. Prerequisites: PHY 401, 404, or equivalent.

407. Quantum Mechanics I. Quantum-mechanical axioms. Probability densities and currents. Boson representations of the oscillator. Angular momentum including Clebsch-Gordan coupling, spherical tensors, finite rotations, and applications to atoms and nu-

clei. Simple gauge transformations. Aharonov-Bohm effect. Bell's theorem. The SO(4) treatment of the hydrogen atom. Prerequisites: PHY 247, 248 or permission of instructor.

408. Quantum Mechanics II. Symmetries including parity, lattice translations, and time reversal. Stationary-state and time-dependent perturbation theory, Stark and Zeeman effects, the fine structure, transition probabilities. Scattering theory with applications. Elementary QED, mulitpole and plane-wave expansions, properties of the photon. The Dirac equation and elementary mass renormalization. Prerequisite: PHY 407 or equivalent.

411. Mechanics and Chaotic Dynamics. Lagrangian and Hamiltonian dynamics, canonical transformations, Hamilton-Jacobi equations, chaotic dynamics and routes to chaos, Fourier spectrum and Poincaré maps, Lyapunov exponents, strange attractors and fractal dimensions, information dimension and Kolmogorov entropy, numerical tests for chaotic behavior. Prerequisite: PHY 235W.

412. Computational Methods for Scientists and Engineers. See ME 403.

413. Gravitation. Motivation for a metric theory of gravity, principle of equivalence, principle of general covariance, mathematical tools, curvature tensor, Einstein field equations and solutions, energy momentum tensor, weak field approximation, applications and optional topics.

415. Electromagnetic Theory I. An advanced treatment of electromagnetic phenomena. Electromagnetic wave propagation, radiation, and waveguides, and resonant cavities, diffraction, electrodynamic potentials, multipole expansions, and covariant electrodynamics. Prerequisite: PHY 401 (may be taken concurrently).

418. Statistical Mechanics I. Review of thermodynamics; general principles of statistical mechanics; microcanonical, canonical, and grand canonical ensembles; ideal quantum gases; applications to magnetic phenomena, heat capacities, black-body radiation; intro-duction to phase transitions. Prerequisites:
PHY 227 or equivalent; PHY 407, 408 (may
be taken concurrently).

420. Introduction to Condensed-Matter Physics. See PHY 251. Same as PHY 251/ECE 220 and ECE 440.

429. Organic Electronics. See CHE 430.

431. Nano-optics. See OPT 463.

434. Quantum Optics and Quantum Information Laboratories. See OPT 492K.

435. Laser Systems. See OPT 465.

**436. Molecular Spectroscopy and
Structure**. See CHM 458.

437. Nonlinear Optics. See OPT 467.

438. Optical Communication Systems. See OPT 428.

439. Nonlinear Spectroscopy.
See CHM 459.

**440. Twentieth-Century Particle
Physics.** Nuclei, nuclear forces, conservation laws, elementary particles, their interactions, and static properties. Same as PHY 254.

445. Advanced Experimental Techniques in Nuclear, Particle, and Electron Spin Resonance. See PHY 245W.

446. Nuclear Science and Technology I. See CHM 466.

451. The Physics of Astrophysics I. See AST 461.

452. The Physics of Astrophysics II. See AST 462.

454. Introduction to Plasma Physics/Stability I. Orbit theory, adiabatic invariants, MHD equations, waves in plasma, shock waves in plasma, diffusion across magnetic fields and in velocity space. Prerequisite: electromagnetic theory. Same as ME 434.

455. Introduction to Plasma II. Vlasov equation, Landau damping, VanKampen modes, shield clouds, two-stream instability, micro-instabilities, drift instability, nonlinear instability theory radiation from plasma. Prerequisite: PHY 454 or permission of instructor. Same as ME 435.

456. Compressible Flow. See ME 436.

457. Incompressible Flow. See ME 437.

462. Medical Imaging Theory and Implementation. Physics and implementation of X-ray, ultrasonic, and MR imaging systems. Special attention is given to the Fourier transform relations, reconstruction algorithms of X-ray and ultrasonic-computed tomography, and MRI. Prerequisite: ECE 242. See ECE 452/OPT 452/BME 452.

464. Biological Physics. Physical aspects of special topics in biology. The purpose of this course is to survey several important areas of biological and medical physics. Topics covered include properties of biological membranes, transport and signaling in cells and tissue, photosynthesis, magnetic resonance imaging, and physical methods in biology such as nuclear magnetic resonance, X-ray diffraction, and optical absorption and fluorescence spectroscopies. The material is presented at the level of Russeu K. Hobbie's *Intermediate Physics for Medicine and Biology*. The course is graded on the basis of regular homework sets, two hourly exams, and a term paper.
Prerequisites: PHY 227, 237, or permission of instructor. See PHY 253.

465. Physics of Radiotherapy I. See PHY 325.

466. Physics of Radiotherapy II. See PHY 326.
467. Physics of Radiobiology I. See
PHY 327.
468. Physics of Radiobiology II. See PHY 328.
475. Experimental Particle Physics for High School Teachers. The department hosts the PARTICLE (Physics and Rochester Teachers Inventing Classroom Experiments) program. Students (high school teachers) study the methods and techniques of experimental partical physics research by participating in the design and construction of detectors for
classroom-based cosmic ray experiments. Prerequisite: permission of instructor.
491. Reading Course at the Master's Level. Special study or work, arranged individually for master's candidates.
492. Certificate in Teaching of College Physics or Physics and Astronomy. After serving as lead teaching assistants (TAs), students teach a course during the University's summer session. Students successfully completing the Graduate Teaching program are awarded a Certificate of College Teaching in Physics and Astronomy to be presented during the graduation ceremony in May.
493. Special Topics in Physics I. Subject matter to be selected by instructor and students on an ad hoc basis in specific areas at the master's level.
494. Special Topics in Physics II. Subject matter to be selected by instructor and students on an ad hoc basis in specific areas at the master's level.
498. Supervised Teaching I. This course is designed for students to become laboratory or recitation teaching assistants (TAs). Typically, students spend the semester teaching two laboratories during the fall semester. Attendance at the weekly teaching seminars, giving feedback to other leaders, and a constructive evaluation process are required. This course is noncredit and may be taken more than once. Students are required to attend a two-day rigorous training program two weeks prior to the beginning of the fall semester. Students prepare and present a short model recitation and are videotaped for self-evaluation.
499. Supervised Teaching II. Continuation of PHY 498.
509. Introduction to Nonrelativistic Many-Body Systems. Classical fields, number representation for Bose and Fermi many-body systems, quantized fields, field methods of perturbation theory, applications to nonrelativistic many-body systems. Prerequisities: PHY 407, 408 or equivalent.
510. Advanced Quantum Mechanics (Relativistic). Review of Dirac equation, covariance and transformation properties of the Dirac equation, propagator theory, applications, second order corrections and renormalization, Klein Gordon equation, nonelectromagnetic interactions. Prerequisite: PHY 509.
511. Field Theory. Path integral formulation of quantum mechanics, free harmonic oscillator, fermionic oscillator, instant tons, free scalar field, Green's functions, generating functional statistical mechanics as Euclidean field theory, partition function as a path integral, free Bose gas, interacting theories, Green's functions and scattering amplitudes at tree level, symmetry, Ward identities, symmetry breaking and Goldstone theorem, effective action at one loop, 1d Ising model, 2d Ising model, duality, high and low temperature expansions, transfer matrix, scaling of coupling with lattice size.
512. Renormalization. Background and introduction to renormalization, one loop divergences in perturbation theory, and Callan Symanzik equation. The renormalization group and Wilson's point of view, effective actions, and operator product expansion. Prerequisite: PHY 509 or 510.
513. Magnetic Resonance Imaging: From Spins to Brains. See BCS 513. Prerequisite: PHY 422/ECE 452.
516. Electromagnetic Theory II. A continuation of PHY 415 covering special relativity, radiation from moving charges, radiation damping, scattering and electrodynamics in material media. Prerequisites: PHY 401, 403, 415 (may be taken concurrently).
519. Statistical Mechanics II. A continuation of PHY 418, involving the theory of imperfect gases, phase transition, and Brownian motion. Prerequisites: PHY 402, 408, 418.
521. Condensed-Matter Physics I. Classification of solids by crystal lattice, electronic band structure, phonons, and optical properties; X-ray diffraction, neutron scattering, and electron screening. Prerequisites: PHY 407, 408, 420, or permission of instructor.
522. Condensed-Matter Physics II. Electron-phonon interaction, transport, magnetism, and topics of current interest such as superconductivity or localization, to be determined by the instructor. Prerequisite: PHY 521.
523/524. Special Topics in Condensed-Matter Physics. Subject matter to be selected by the instructor from among topics of current interest in solid state. Prerequisite: PHY 521.
527. Computational Neuroscience in Physics. See BCS 547.
531. Introduction to Quantum Optics. Classical and quantum mechanical theories of the interaction of light with atoms and molecules, with emphasis on near resonance effects, including coherent nonlinear atomic response theory, relaxation and saturation, laser theory, optical pulse propagation, dressed atom-radiation states, and multi-
photon processes. Prerequisites: PHY 401, 402, 407, 408, 415 or permission of instructor; PHY 514 recommended.
532. Quantum Optics of Electromagnetic Field. Properties of the free quantized electromagnetic field, quantum theory of coherence, squeezed states, theory of photoelectric detection, correlation measurements, atomic resonance fluorescence, cooperative effects, quantum effects in nonlinear optics. Prerequisites: PHY 531 is recommended.
533. Quantum Optics of the Atom-Field Interaction. Subject matter is selected from topics of current interest in quantum optics.

534. Mechanical Effects in the Atom-Field Interaction. Subject matter is selected from topics of current interest in quantum optics.
535. Modern Coherence Theory. Coherence and special topics in coherence. Same as OPT 592.
536. Special Topics in Quantum Optics. Same as OPT 556.
537. Statistical Optics. Topics include Elements of Applied Probability Theory: Probability theory, random variables, density and distribution functions, moments of a random variables, density and distribution functions, characteristic and moment generating functions, and the
central-limit theorem. Introduction to Stochastic Process: Stationarity and ergodicity, correlation functions, power or Wiener spectrum, Gaussian processes, Poisson point processes. Coherence theory of Optical Fields, Laser Speckle and its applications, Photoelectric Detection of Light. Prerequisites: OPT 461 and 462; students are encouraged to take PHY 404 concurrently.
538. Advanced Topics in Light Wave Technologies. See OPT 532.
539. Waveguide Optoelectronic Devices. See OPT 568.
541. Nuclear Structure I. Nuclear models and symmetries in nuclei; shell model, models pertinent in regions of strong pairing interactions, including BCS and generalized seniority; the microscopic theory of vibrations; rotational structures in heavy and light nuclei. Prerequisites: PHY 408 and either PHY 440 or permission of instructor.
542. Nuclear Structure II. Electromagnetic and weak transitions; sum rules, introduction to nuclear reactions, theory of nuclear forces. Prerequisite: PHY 541.
544. Special Topics in Nuclear Physics. Subject matter to be selected from among advanced topics in the theory of nuclear structure and nuclear reactions. Prerequisites: PHY 541, 542.
546. Nuclear Science and Technology II. Experimental and theoretical studies of heavy-ion scattering and reaction mechanisms; semiclassical and quantal scattering theory; Coulomb excitation; few-nucleon transfer; damped heavy-ion reactions; fusion and fission processes; statistical approaches to complex nuclear reaction mechanisms. Prerequisite: PHY446/CHM466. Same as CHM 566. (Fall, follows PHY 446, offered every other year)
552. Magnetohydrodynamics. See
ME 532.
553. Laser-Plasma Interactions. See
ME 535.
554. Cosmology. See AST 554.
555. Advanced Topics in Plasma
Physics. See ME 545.
556. Hydrodynamic Stability and
Turbulence. See ME 536.
557. Plasma Stability. See ME 534.
558. Inertial Confinement Fusion.
See ME 533.
564. Seminar on High-Energy
Astrophysics. See AST 564.
581. Particle Physics I. Particle interactions and their symmetries. The particle spectrum and its classification. Calculation of elementary processes. The quark model. CP violation. Accelerators and experimental techniques. Prerequisites: PHY 408, PHY 509 (may be taken concurrently).
582. Particle Physics II. Electroweak theory, and experimental evidence in support of it. Gauge theories and spontaneous symmetry breaking. QCD and color SU(3). Grand unification and recent advances. Particles and cosmology. Prerequisite: PHY 509.
584. Special Topics in Particle Physics. Subject matter to be selected from topics of current interest in particle physics. Prerequisite: PHY 582.
591. Reading Course at the Ph.D. Level. Credit to be arranged. Special study or work, arranged individually.
597. Graduate Teaching and Research Seminar. Credit—none. Course is given once per week; required for all first-year graduate students. The seminar consists of lectures and discussions on various aspects of being an effective teaching assistant, including interactions with undergraduate student body and cross-cultural issues. (Fall and Spring)
598. Teaching Workshop Leader
Pedagogy Training. Credit—none. This course is designed for students to be workshop leader teaching assistants (TAs). Typically, TAs attend the weekly workshop leader training meeting, which offers specialized support and training in group dynamics, learning theory, and science pedagogy for students facilitating collaborative learning groups for science and social science courses. TAs teach three to four workshops in one of the fall semester introductory physics courses: PHY 113, 122, 141, or 142. Attendance at the weekly Graduate Teaching Seminar (PHY 597A), giving feedback to other leaders, and a constructive evaluation process are required. Course may be taken more than once.
599. Pedagogy and Group Leadership. Credit—none. This course is designed as a follow-up course after taking PHY 598, for

experienced workshop leaders, titled *lead* workshop leader teaching assistants (TAs). Typically, TAs attend the weekly workshop leader training meeting, which offers specialized support and training to develop leadership skills, to foster ongoing communication among faculty members and study group leaders, and to provide an environment for review of study group–related issues. Students spend the semester teaching three to four workshops during the spring semester introductory physics courses: PHY 114 and 121. Attendance at the weekly Graduate Teaching and Research Seminar (PHY 597B), giving feedback to other leaders, and a constructive evaluation process are required. *Lead* Workshop TAs are required to work closely with the faculty mentor/instructor in charge of the course. Lead Teaching Assistants have additional responsibilities that may include small projects, giving review sessions, serving on occasion as substitute lecturers and are required to play a major role in the TA Training Program for the following academic year. Course may be taken more than once.

ASTRONOMY

102. Black Holes, Time Warps, and the Origin and Large-Scale Structure of the Universe. In AST 102 we present a physical and astronomical (but non-mathematical) picture of the workings of Einstein's theory of relativity, and its application to cosmology and to black holes and wormholes, the most exotic and energetic objects known to scientists. Our aim is twofold: (1) to demystify black holes, big-bang cosmology, and the nature of space and time for non-science majors, to enable them to evaluate critically the frequent references to these exoteric concepts in the press and in popular science and science-fiction literature; and (2) to provide non-science majors with a glimpse of the processes by which scientific theories are con-ceived and advanced. In the course we make heavy use of computer- generated graphics and simulations during lectures, make available all course-related resources in an extensive World Wide Web site, and use the WeBWorK system for homework. Prerequisites: none. (Fall)

104. The Solar System. To acquaint the nonphysical science concentrator with aspects of the historical and modern study of the solar system, including results from space probe studies, and with theories dealing with the evolution of the solar system. Prerequisites: high school math through intermediate algebra. No physics required. (Fall)

105. Introduction to the Milky Way Galaxy. In this course we introduce students to our home galaxy, the Milky Way, and use the structure and contents of this normal galaxy to illustrate the origins of stars like the Sun, the origins of the chemical elements from which we are formed, and the evolution of galaxies through the life of the universe. The emphasis in the presentation is on the descriptive astronomy and the physical principles describing the operation of the various celestial objects, with a minimum of mathematical detail. Prerequisites: none. (Spring)

111. The Solar System and Its Origin. Familiarization with the tools, methods, and concepts of astronomy and the study of the observational basis for understanding the solar system. The course goes as far as single-variable calculus, classical mechanics, Newton's law of gravity, and the ideal-gas law takes it. The course covers the structure and composition of the individual planets and many smaller solar-system bodies, as well as the orbital dynamics and overall structure of the solar system. No formal prerequisites, but the course is intended for science majors who have had beginning calculus or are taking it concurrently. Mathematical formulations of physics are used to describe planetary phenomena.

142. Elementary Astrophysics. The techniques learned in the first year of physics and math are applied in this course to the study of stars, interstellar matter, galaxies, and cosmology. Prerequisites: PHY 121, 122 (may be taken concurrently); MTH 142, 161, 162; AST 111 recommended. (Spring)

231. Gravitation and General Relativity. A first course on general relativity targeted at junior and senior physics and astronomy majors. This course begins with a thorough conceptual and mathematical treatment of special relativity and the connection between physics and spacetime. The course then builds the general theory by showing how Einstien's theory incorporates gravity through its effect on spacetime geometry. Applications to black holes and cosmology are derived. The mathematics of tensors and geometry are also covered.

232W. The Milky Way Galaxy. This class focuses on our home galaxy and all that's in it. After a review of some aspects of fundamental astrophysics, students learn about the Interstellar Medium (ISM) and its life-cycle, the role of stars and stellar evolution in determining the characteristics of the ISM, star formation, stellar death, supernova, planetary nebulae, galactic structure, galactic kinematics, spiral wave theory, and the galactic center. This course is the same as AST 232, except with additional writing assignments. May be used towards satisfying the upper-level writing requirement. Prerequisite: familiarity with PHY 235 and AST 142 is advised. (Fall, odd years)

241. Astrophysics I. This introduction to the physics of stars is taken primarily by juniors and seniors majoring in physics and astronomy, physics, optics, or mathematics. The elements of radiative transfer and gas dynamics are presented and applied to the study of the atmospheres of stars. The interior structure and evolution of stars of various types are also discussed. Prerequisite: PHY 237 (may be taken concurrently); familiarity with the subject matter of AST 111 and/or 142 is advised. (Spring, odd years)

242. Astrophysics II. This introduction to the physical processes in astronomical objects is taken primarily by juniors and seniors majoring in physics, physics and astronomy, optics, or mathematics. Topics discussed include physical processes in the interstellar medium; star formation and molecular clouds; the structure of galaxies; and interaction to cosmology. Prerequisite: PHY 237 (may be taken concurrently); familiarity with subject matter of AST 142 is advised. (Spring, even years)

383. Special Topics in Astronomy. Selected topics offered when justified by sufficient interest.

391. Independent Study. Independent study project under the direction of a faculty member of the Department of Physics and Astronomy. (Fall, Spring, and Summer)

391W. Independent Study. Independent study project under the direction of a faculty member of the Department of Physics and Astronomy. This course includes a writing component and can be used to satisfy part of the upper-level writing requirement. (Fall, Spring, and Summer)
393. Senior Project. Completion of an independent research project under the direction of a faculty member of the Department of Physics and Astronomy. (Fall, Spring, and Summer)
393W. Senior Thesis. Completion of an independent research project under the direction of a faculty member of the Department of Physics and Astronomy. This course includes a writing component and can be used to satisfy part of the upper-level writing requirement. (Fall, Spring, and Summer)
395. Independent Research. Independent research project under the direction of a faculty member of the Department of Physics and Astronomy. (Fall, Spring, and Summer)
395W. Independent Research. Independent research project under the direction of a faculty member of the Department of Physics and Astronomy. This course includes a writing component and can be used to satisfy part of the upper-level writing requirement. (Fall, Spring, and Summer)

GRADUATE ASTRONOMY
The following graduate courses are open to advanced undergraduates with permission of the instructor.
403. Experimental Techniques in Astronomy. This course is an introduction to the tools of modern observational astronomy. We discuss geometrical and physical optics applied to telescopes and astronomical cameras; the physics of light detection at radio, infrared, visible, X-ray, and γ-ray wavelengths; and the instruments and techniques used for observations of faint celestial objects over the full useful range of spectral and angular resolution. The intention is to provide to students the preparation necessary to design, build, and optimize astronomical instruments. How-ever, the material should be useful to anyone who will be using remote-sensing instruments, astronomical or otherwise, or is seeking to understand measurements made with these devices. Prerequisites: The equivalent of PHY 217, 218, ME 201 or MTH 281, and PHY 227.
450. Stellar Atmospheres. Spectra of main sequence stars. Radiative transfer. The gray atmospheres. Theory of line formation and broadening: curve of growth analyses of stellar spectra.
453. Stellar Interiors and Stellar Atmos-pheres. A first course on interiors and atmospheres devoting approximately 50 percent of a semester to each. See AST 450 and AST 553 for full-fledged courses.
455. Astronomical Interferometry. This course is an introduction to the principal technique of modern radio astronomy, and an increasingly important tool for infrared and visible wavelengths: spatial interferometry. We discuss the elements of physical optics, coherence theory, and the physics of detectors and receivers that bear on astronomical interferometry, following this formal development with a detailed account of the practice of interferometry, calibration, and data reduction. The intention is to provide to students all they need to know to understand, plan, propose, and analyze observations with such instruments as the Very Large Array (VLA), the Very Long Baseline Array (VLBA), the Owens Valley Radio Observatory's (OVRO) Millimeter Array, and the Berkeley-Illinois-Maryland Array (BIMA) at Hat Creek Radio Observatory. Prerequisites: AST 403, PHY 415.
461. Physics of Astrophysics I: Radiative Processes. One-half of the required two-part sequence (can be taken before or after 462). Focuses on the physics of radiation production by ionized and atomic matter, the transfer of radiation through matter, and what is measured from astrophysical objects. Concepts are developed from first principles and many applications in astrophysics are studied.
462. Physics of Astrophysics II: Astrophysical Fluids and Plasmas. One-half of the required two-part sequence (can be taken before or after 461). Focuses on hydrodynamic and plasma processes relevant to astrophysics. Fundamentals of fluid dynamics and magnetohydrodynamics, fluid, MHD, and thermal instabilities, turbulence, and supersonic and subsonic flow. Accretion physics, shocks, dynamos, particle acceleration in plasmas, dynamics of magnetic fields. Concepts are developed from first principles and many applications in astrophysics are studied.
465. Observational Galactic Structure. Star, gas, and dust distribution in our galaxy. Structure studies and classification of other galaxies. Clusters of galaxies, red shifts, Seyfert galaxies, peculiar galaxies, quasars.
551. Diffuse Matter in Space. Physical state of gas and dust. Heating and cooling mechanisms. Grain and molecular formation. Gas dynamics, ionization fronts, SN explosions.
552. Galactic Dynamics. Boltzmann equation and collision theory. Structure and evolution of clusters, numerical experiments, Galactic hydrodynamics, wave theory of spiral arms, models of galactic nucleus regions, superdense cluster theory.
553. Stellar Interiors. Quantitative theory of model integration and description of early stages of evolution. Variable stars and rotational models. Later stages of evolution, white dwarfs, neutron stars, nucleosynthesis, SN models.
554. Cosmology. General relativity with emphasis on astronomical applications: experimental tests; black holes; relativistic star models; cosmological models; early stages of evolution of the universe; gravitation waves. Same as PHY 554.
563. Seminar on Radio Astronomy and Infrared Astronomy. A survey of current research reports in scientific journals on topics including research on pulsars, quasars, and radio and infrared observations of the interstellar medium.
564. High-Energy Astrophysics. A survey of current research topics in high-energy astrophysics. Topics drawn from X-ray and

gamma-ray astrophysics, supernovae and planetary nebulae, binary accretors, astrophysics of compact objects (black holes, neutron stars, white dwarfs), plasma astrophysics, magnetic field-particle interactions, cosmic rays, astrophysical jets, active galactic nuclei. Same as PHY 564.

POLISH AND CENTRAL EUROPEAN STUDIES

COMMITTEE ON POLISH AND CENTRAL EUROPEAN STUDIES

Kathleen Parthé, Ph.D. (Cornell) *Professor of Russian*
Celia Applegate, Ph.D. (Stanford) *Professor of History*
Ewa Hauser, Ph.D. (Johns Hopkins) *Adjunct Associate Professor of Political Science*
James D. Johnson, Ph.D. (Chicago) *Associate Professor of Political Science*
Randall Stone, Ph.D. (Harvard) *Associate Professor of Political Science; Director of the Skalny Center for Polish and Central European Studies*

The Skalny Center for Polish and Central European Studies provides students with an opportunity to develop an interdisciplinary knowledge of Polish and Central European politics, history, cultures, and international relations with Eastern (Russia/Soviet Union/Post-Soviet States) and Western Europe, as well as with the United States. An interdepartmental major or minor in Polish and Central European Studies (PCES) may be designed through the Center and is administered through the College Center for Study Abroad and Interdepartmental Programs. The Center itself offers a Certificate in Polish and Central European Studies.

Course offerings include courses taught by the College faculty as well as by visiting scholars from Poland and Central Europe. Some of the course offerings are taught at the Jagiellonian University in Krakow. It is strongly recommended that those interested in developing their knowledge of this region participate in one of the University of Rochester–sponsored one-semester study abroad programs in Poland or Central Europe. Students interested in the certificate should contact Professor Ewa Hauser in the Department of Political Science. Those planning to study in Poland should inquire at the Skalny Center for Polish and Central European Studies about Skalny Scholarships. Students interested in a major or minor in Polish and Central European Studies can obtain detailed information from the Center for Study Abroad and Interdepartmental Programs.

CERTIFICATE REQUIREMENTS

The Polish and Central European Certificate Program provides students with an opportunity to develop an interdisciplinary knowledge about Poland and Central Europe. Interested students should put together a list of 10 courses (or 40 credit hours) with the following departmental distribution:

1. Six courses from the Primary list:
- **a.** Four must be in social sciences (political science, economics, or history)
- **b.** Two must be in languages (any western Slavic language, Romanian, Hungarian, or Yiddish) or cultures (anthropology, art, film studies, music, philosophy, theater, or religion)

2. Four additional courses from either the Primary or Secondary list. Substitutes for these courses may be approved by the student's PCE studies director. Up to two substitute courses may be foreign language courses above the 105 level.

Courses transferred from another college must be approved by the student's PCE studies director. No primary course may be taken satisfactory/fail, and no more than one secondary course may be taken satisfactory/fail. Students must earn an overall grade-point average of at least 2.0 in courses submitted for the certificate. Upon graduation, students successfully completing the PCE studies program will receive a Certificate in Polish and Central European Studies.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

PRIMARY COURSES

Political Science and History

PSC 106. Introduction to International Relations.
HIS 205. Europe Since 1945.
PSC 251/ANT 262. Old and New Nationalism in Eastern Europe.
PSC 255/ANT 262. Political Films: Poland and Eastern Europe.
PSC 256. Globalization of Post-Communist Economics.
PSC 262. Post-Communist Politics.
PSC 269. Communism and Democracy in Eastern Europe.
PSC 270. International Politics.
PSC 272. Theories of International Relations.
PSC 274. International Political Economy.
PSC 292. Politics and Economics of Post-Communist Transformation.
PSC 377. Perspectives on War and Peace: Central Europe.
HIS 116. History of Poland.
HIS 119. The Rise of Modern Nations in Eastern Europe.
HIS 206/REL 218. The Holocaust.
HIS 241/RUS 248. Politics of Identity: Russian, Poles, Jews, and Communists.
HIS 351. Topics in Nationalism and National Identity.
HIS 301W. The Holocaust.

Languages and Cultures
POL 101. Elementary Polish I.
POL 102. Elementary Polish II.
POL 103. Polish Review.
POL 107. Polish in Poland.
POL 151. Intermediate Polish.
YDH 101. Introductory Yiddish.
YDH 102. Intermediate Yiddish.
YDH 340. Advanced Yiddish.
REL 289. Literature of the Shtetl.
RUS 289/HIS 243. Dangerous Texts: Literature and Politics in Russia.

Primary Courses Offered Occasionally by Visiting Faculty
ENG 355V. Joseph Conrad.
PSC 156. U.S. Policy toward Eastern Europe during the Cold War.
PSC 158. Holocaust Film from Europe.
PSC 254. Political Economy of Post-Communism.
PSC 256. Central European Political Economy.
PSC 257. Small Town Transitions in Poland.

SECONDARY COURSES
ANT 222. Nations and Nationalism.
HIS 100. Europe before 1492.
HIS 113. Europe in the Nineteenth Century.
HIS 114. Europe in the Twentieth Century.
HIS 117. Women in History: Modern Europe.
HIS 150/RUS 128. Russian Civilization.
HIS 151. History of Imperial Russia.
HIS 152. Stalin's Russia.
HIS 153/RUS 127. Russia Now.
HIS 247/RST 247. Secret Nation.
PSC 101. Introduction to Comparative Politics.
PSC 350. Problems in Comparative Politics.
PSC 351. Western European Politics.
RST 224. Russian Art.

A current list of courses (including courses offered by visiting faculty on a one-time basis) is available at the Skalny Center for Pol-

ish and Central European Studies.

POLITICAL SCIENCE

John Duggan, Ph.D. (California Institute of Technology) *Professor of Political Science and of Economics*
Thomas H. Jackson, J.D. (Yale) *Distinguished University Professor of Political Science, Distinguished University Professor of Business Administration in the William E. Simon Graduate School of Business Administration, and Professor in the W. Allen Wallis Institute of Political Economy*
Bruce Jacobs, Ph.D. (Harvard) *Professor of Political Science; University Dean of Graduate Studies*
Richard G. Niemi, Ph.D. (Michigan) *Don Alonzo Watson Profes-sor of Political Science*
Charles E. Phelps, Ph.D. (Chicago)
University Professor, Professor of Political Science, of Economics, and of Community and Preventive Medicine
G. Bingham Powell, Jr., Ph.D. (Stanford) *Marie Curran Wilson and Joseph Chamberlain Wilson Pro-fessor of Political Science*
Lynda W. Powell, Ph.D. (Rochester) *Profes-sor of Political Science*
Lawrence S. Rothenberg, Ph.D. (Stanford) *Corrigan-Minehan Professor and Professor of Political Science*
Joel Seligman, J.D. (Harvard University Law School) *Professor of Political Science and Professor of Business Administration in the William E. Simon Graduate School of Business Administration*
Kevin A. Clarke, Ph.D. (Michigan) *Associate Professor of Political Science*
Mark Fey, Ph.D. (Caltech) *Associate Professor of Political Science*
Gerald Gamm, Ph.D. (Harvard) *Associate Professor of Political Science and of History; Chair of the Department*
Gretchen Helmke, Ph.D. (Chicago) *Associate Professor of Political Science*
James D. Johnson, Ph.D. (Chicago) *Associate Professor of Political Science*
Bonnie M. Meguid, Ph.D. (Harvard)
Associate Professor of Political Science
David M. Primo, Ph.D. (Stanford) *Associate Professor of Political Science*
Curtis Signorino, Ph.D. (Harvard) *Associate Professor of Political Science*
Randall W. Stone, Ph.D. (Harvard) *Associate Professor of Political Science*
Hein Goemans, Ph.D. (Chicago) *Assistant Professor of Political Science*
Stuart Jordan, Ph.D. (Princeton) *Assistant Professor of Political Science*
Anastassios Kalandrakis, Ph.D. (California, Los Angeles) *Assistant Professor of Political Science*
Michael Peress, Ph.D. (Carnegie Mellon)
James P. Wilmot Distinguished Assistant Professor and Assistant Professor of Political Science
Valeria Sinclair-Chapman, Ph.D. (Ohio State) *Assistant Professor of Political Science*
William T. Bluhm, Ph.D. (Chicago) *Professor Emeritus of Political Science*
Richard F. Fenno, Jr., Ph.D. (Harvard)
Wil-liam R. Kenan Professor Emeritus of Political Science and Distinguished University Professor Emeritus
S. Peter Regenstreif, Ph.D. (Cornell)
Professor Emeritus of Political Science and Canadian Studies

The Department of Political Science offers programs in political science and international relations leading to the B.A. degree and the B.A. degree with honors. For undergraduates not concentrating in political science or international relations, the department offers minors as well as 12 clusters.

The Department of Political Science takes pride in its youth and its record of achievement. The Ph.D. program is less than five decades old, and it is only since the 1970s that the department has supported one of the largest undergraduate concentrations in the College. Yet the department is now routinely ranked among the top handful of political science departments in the country. Senior scholars on the faculty include two fellows of the American Academy of Arts and Sciences, a former managing editor of the *American Political Science Review*, two Guggenheim fellows, and a Woodrow Wilson Center fellow. Additionally, faculty have been invited as visiting scholars to the Russell Sage Foundation, Harvard University's Weatherhead Center for International Affairs, Nuffield College in Ox-

ford, and the Center for Advanced Study in the Behavioral Sciences. The faculty also includes a large number of the discipline's emerging young stars, scholars, and teachers engaged in innovative and award-winning work.

The department is constantly conscious of the relationship between teaching and scholarly research. William H. Riker, who established the graduate program at Rochester in the early 1960s, always held that scholarship consists in the production and dissemination of knowledge, and that publication and teaching ought to fit almost seamlessly together in that process. Thus, along with faculty distinguished for their research and publications, the department is proud to house recipients of the College's and University's highest awards for teaching at the undergraduate and graduate levels. Today, as throughout the department's history, the faculty remain committed to the principle that world-class teaching and research are complements. New research enriches and energizes the department's teaching, and good teaching forces faculty constantly to reevaluate research findings in light of new facts, questions, and events.

Through coursework and internships—including programs in Brussels, London, Washington, and the local offices of the district attorney and public defender—the department presents students with multiple opportunities to study and immerse themselves in the hurly-burly of politics. Undergraduate students gain familiarity with American political behavior and institutions, political systems in other countries, the sources of international conflict and cooperation, political theory, and the systematic analysis of data and evidence. The department supports research and teaching centers in African-American politics and international politics, and it enjoys close working relationships with centers in political econ-omy, Polish and Central European politics, and women's studies.

The department's distinctive strength is its emphasis on teaching students to look beyond unique events to general truths. The faculty is committed to providing students with the ability and tools to think for themselves about the world they inhabit—to question, to write clearly, to make and defend assertions, and to understand the relationship between theory and evidence. All political science majors take a course in basic political methodology, which provides them with the ability to read and interpret data. Additionally, they are required to take a course in argument, providing them with a framework to construct, defend, and criticize theories and evidence. Students who major in international relations are required to study diverse modeling approaches to international affairs and comparative politics. They must also take focused coursework in global security, political economy and development, or the governance of nations. Moreover, the department is distinctive in supporting a range of undergraduate courses in positive political theory. Students have a wide range of courses from which to choose, and they are encouraged to explore their interests with depth and passion. Every member of the faculty teaches undergraduates as well as graduate students, and all undergraduate concentrators are advised by full-time faculty members. Classes are generally small, and undergraduates have many opportunities to pursue scholarship at an advanced level.

For more information on political science and international relations, visit the departmental Web site at www.rochester.edu/college/PSC.

REQUIREMENTS FOR CONCENTRATION IN POLITICAL SCIENCE

For the full set of concentration requirements, visit the departmental Web site at www.rochester.edu/college/PSC. The Web site is regularly updated with new courses, advising information, department events, office hours, and other information relevant to concentrators.

The concentration in political science requires that students successfully complete at least 12 courses, achieving a minimum overall grade-point average of 2.0 in these courses. None of the 12 courses may be taken on a satisfactory/fail basis. As part of their concentration, students must fulfill the department's upper-level writing requirement.

The 12 courses are PSC 202, *four* political science field requirements, and *seven* other courses:

- PSC 202, Argument in Political Science, is the only course specifically required for a concentration in political science.
- Four field requirements:
  a. Techniques of Analysis. PSC 200, 201, 203, or 204. (Students may also satisfy this requirement with ECO 230 or 231. However, ECO 230 or 231 counts as a course in an allied field rather than as a course in political science.)
  b. American Politics. Choose at least one course from the list of approved courses.
  c. Comparative Politics or International Relations. Choose at least one course in either field from the list of approved courses.
  d. Positive Theory or Political Philosophy. Choose at least one course in either field from the list of approved courses.
- Seven additional courses:
  a. Students may choose any seven additional courses in political science. These may include any courses from the various fields, but may also include individualized research courses, internships, and associated courses. No more than three of these, however, may be chosen from the list of associated courses. As many as three of these seven courses may come from another department, provided they follow the guidelines in the next paragraph for courses in an allied field. Also, no more than four courses counted toward the

concentration may be at the introductory level (generally, 100-level courses); of these four introductory courses, no more than one may come from another department.

Note on allied field: Courses in the allied field (up to three) may consist of any courses from either economics, history, or philosophy, provided that the courses come from the same department and that no more than one of these courses is at the introductory level. For courses from other departments or for interdepartmental allied fields, advisors expect students to provide a coherent justification for the courses chosen. A general guideline used to determine acceptability of a proposed allied field is that the courses enhance the students' understanding of politics. Proposals that cut across departments or that include more than one introductory-level course require special justification. *Changes to allied field courses other than those in the three listed departments must be approved in writing by an advisor*.

REQUIREMENTS FOR CONCENTRATION IN INTERNATIONAL RELATIONS

For the full set of concentration requirements, visit the departmental Web site at www.rochester.edu/college/PSC. The Web site is regularly updated with new courses, advising information, department events, office hours, and other information relevant to concentrators.

The major in international relations requires that students successfully complete at least 12 courses, achieving a minimum overall grade-point average of 2.0 in these courses. To fulfill the requirements of the major, students must also complete two college-level courses taught in a foreign language and participate in a program of Study Abroad (in either the fall, spring, or summer). None of the 12 courses may be taken on a satisfactory/fail basis. At least nine of these 12 courses must be in political science. No more than four introductory courses may be included in the 12 courses for the international relations major.

The 12 courses must include the four required core courses, five courses in the specialized tracks (at least three of which come from a single track), and three elective courses. The specialized tracks are Global Security, Political Economy and Development, and Governance of Nations.

Core Requirements

All students must take *four* courses as specified below.

COMPARATIVE POLITICS CORE

Students must take at least two of the three following:

- IR 101. Introduction to Comparative Politics
- IR 256. Theories of Comparative Politics
- IR 258. Democratic Regimes

INTERNATIONAL RELATIONS CORE

Students must take at least two of the three following:

- IR 106. Introduction to International Relations
- IR 270. Mechanisms of International Relations
- IR 272. Theories of International Relations

Specialized Tracks

Five courses, three of which must be from a single track

Electives

Three courses

HONORS IN POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

Each fall the Department of Political Science invites a select group of top juniors with a concentration in political science or international relations to take part in the honors program. The Honors Coordinator assesses the pool of juniors in both majors and coordinates invitations based on grades in the major, overall GPA, and nominations from the faculty. Juniors who seek to enter the honors program but have not been invited to do so may petition the Honors Coordinator to be considered for admission. Places in the honors program are limited.

Attainment of honors in political science or international relations requires successful completion of the junior honors seminar (PSC 389W), offered in the spring of the third year, and a yearlong senior honors project supervised by a full-time faculty member in the Department of Political Science (or, in the case of students with a concentration in international relations, a full-time faculty member in the field). Typically, the senior honors project is a work of 60 to 120 pages in length. Evaluation of the project is not, how-

ever, a reflection of the quantity of pages but of the quality of the work: a good idea and thorough and successful original research are in fact the sole requirements for an acceptable project. The senior honors project should be *an original contribution to knowledge in political science or international relations*. This may entail original research on a question that has received little scholarly attention in the field or an original contribution to scholarship on a question of recognized importance in the discipline.

Students with an interest in pursuing an honors degree in political science or international relations are urged to take PSC 200 or 201 in the sophomore year.

For more information on the honors program, visit the departmental Web site at www.rochester.edu/college/PSC/undergrad/majors.php#honors.

REQUIREMENTS FOR A MINOR IN POLITICAL SCIENCE

The minor in political science requires that students successfully complete five courses, of which only one may be from the list of introductory (100-level) courses. None of the five courses may be taken on a satisfactory/fail basis. The five courses must be distributed in the following fashion:

1. PSC 202**,** Argument in Political Science, is the only course specifically required for a minor in political science.
2. Techniques of Analysis. PSC 200, 201, 203, or 204.
3. American Politics. Choose one course from the list of approved courses.
4. Comparative Politics or International Relations. Choose one course in either field from the list of approved courses.
5. Positive Theory or Political Philosophy. Choose one course in either field from the list of approved courses.

REQUIREMENTS FOR A MINOR IN INTERNATIONAL RELATIONS

Students must successfully complete six courses, of which at least four must be taken in political science. No more than three courses (whether in political science or another department) may be at the introductory level. None of the six courses may be taken on a satisfactory/fail basis. No course may be transferred from another school (except for approved courses taken abroad). Choice of courses must also satisfy the requirements specified below:

Comparative Politics Core

Choose one of the following:
• IR 101. Introduction to Comparative Politics
• IR 256. Theories of Comparative Politics
• IR 258. Democratic Regimes

International Relations Core

Choose one of the following:
• IR 106. Introduction to International Relations
• IR 270. Mechanisms of International Relations
• IR 272. Theories of International Relations

Four Additional Courses

Choose any four courses (at least two in political science) from the list approved for the specialized tracks. Courses taken abroad may, upon approval, substitute for up to two of these courses.

CLUSTERS IN POLITICAL SCIENCE AND INTERNATIONAL RELATIONS

For students with a concentration in the humanities, the natural sciences, or engineering, the Department of Political Science offers a large and varied set of clusters. For more information on the department's clusters, including the courses available in each cluster, visit the departmental Web site at www.rochester.edu/college/PSC/undergrad/minors.php#clusters. These are clusters offered in political science and international relations:

1. America and the World.
2. American Political History.
3. American Politics and Policy.
4. Comparative Politics.
5. European Politics and Civilization.
6. International Relations.
7. Poland, Russia, and Central Europe.
8. Political Economy.

9. Political Methods and Theory.
10. Political Philosophy.
11. Politics and Mathematics.
12. Politics and Religion.
13. World Politics.

WRITING REQUIREMENT FOR POLITICAL SCIENCE

Political science majors fulfill the department's writing requirement by taking PSC 202 and one or more 200- or 300-level courses in political science that are designated as writing intensive. These courses carry a "W" designation. "W" courses require students to write a term paper of 10–15 pages (about 3,500 words), with the term paper involving research that goes beyond the regular class material. The faculty is encouraged to have students submit a draft of a portion of the term paper before they turn in the final product.

WRITING REQUIREMENT FOR INTERNATIONAL RELATIONS

International relations majors fulfill the writing requirement by taking two courses for the major that are designated as writing intensive. These courses may include PSC 202 (which could count as one of the three electives) or any course for the major that carries a "W" designation. Ordinarily, "W" courses require students to write a term paper of 10–15 pages (about 3,500 words), with the term paper involving research that goes beyond the regular class material. The faculty is encouraged to have students submit a draft of a portion of the term paper before they turn in the final product.

COURSES OF INSTRUCTION IN POLITICAL SCIENCE

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

REQUIRED COURSE

202. Argument in Political Science. Introduces students to the questions, concepts, and analytical approaches of political scientists. Possible topics vary from semester to semester. One version of the course focuses on the tension between majority rule and minority rights in the American political tradition, using classic texts in American politi-cal thought (such as the Declaration of Independence, *The Federalist,* and Tocqueville's *Democracy in America*) as well as books and articles written by contemporary political scientists. Another version focuses on racial and gender conflict in American political life. Other versions may draw on material from comparative politics, political theory, or international relations.

TECHNIQUES OF ANALYSIS

200. Applied Data Analysis. Introduces the study of politics through data analysis, including instruction in the use of computers and basic statistical software.
201. Political Inquiry. Introduces the nature of research in political science. Topics include the scientific method, the development of hypotheses about political phenomena, and the analysis of data.
203. Survey Research Methods. Offers an introduction to the understanding of politics through data analysis, with particular emphasis on surveys of the mass public.
204. Research Design. In this class, students learn the techniques behind designing research studies that allow political scientists and economists to answer hot-button political questions.

AMERICAN POLITICS

103. Great Debates in American Democracy. Examines some of the great debates and crises that have shaped the American political system. Same as HIS 163.
105. Dilemmas in American Politics. Examines how America has attempted to resolve, and sometimes succeeded in resolving, several important political dilemmas. Key issues include how America should govern itself, who to include among its citizenry, and how to balance the interests of individuals against those of the states and the nation as a whole.
121. Democracy in America. Democracy literally means "rules by the people." This definition raises various questions, which are explored in the context of twentieth-century American politics.
124. Race and Politics in American History. Examines how race has shaped and influenced the development of American political institutions.
194. Rochester Politics and Places. Focuses on the rich history of Rochester as well as learning about current debates over political organization, racial and economic segregation, suburbanization, and economic change.
209. Interest Groups in America. Introduces issues that concern political scientists and economists about interest groups in American politics.
210. Development of the American Party System. Examines the emergence of political parties in the United States, debates over the legitimacy and purpose of party organization, and changes in the American party system over time.
211. Public Opinion and Voting. Examines public opinion and voting, with special attention to generational differences. How

much do citizens know about government and politics? Does participation make a difference? Do elected officials do what the public wants?

212. The Supreme Court in U.S. History. Through lecture, readings, and discussion, students consider major questions involving public opinion and voting, paying special attention to generational matters.

213. The U.S. Congress. Offers an overview of the legislative branch of the United States government, discussing the electoral process, the nature of representation, legislative organization, the committee system, floor procedure, congressional parties, and inter-branch relations.

214. Political Participation in the United States. Seminar surveying the ways in which individuals and groups participate in political processes and the functions these activities serve. Same as AAS 214.

215. American Elections. Examines topics in state and national elections, including the electoral college, campaign finance reform, and the role of money in elections.

216. Legislative Politics. Examines Congress in its dual roles as both a national lawmaking institution and as the nexus of public representation in the policymaking process.

217. Politics and Mass Media. Analyzes the interaction of politics and mass media, focusing on techniques of opinion manipulation, campaigning, and the use of polls.

218. Emergence of the Modern Congress. Seminar on major issues in congres-sional history and legislative development. Same as HIS 342.

220. Social Movements in the United States. Surveys social movements in the United States, including Populist, labor, civil rights, and women's movements. Same as AAS 220.

221. Philosophical Foundations of the American Revolution. Analyzes the philosophical foundations of the American Revolution by examining the political theory which lies behind the revolution itself and which underlies the foundations of the Constitution, while keeping an eye at the historical contexts that shaped the philosophy.

222. The Presidency. Studies recent presidential campaigns and presidential leadership in both foreign and domestic policy.

223. Constitutional Structure and Rights. Studies essential structure of the American legal system and civil rights of citizens.

224. African-American Politics. Surveys the political strategies adopted by African-Americans since Reconstruction to forge organized resistance to racial domination in the United States. Same as AAS 224.

225. Race and Political Representation. Introduces democratic theory, the civil rights movement, the Voting Rights Act, African-American public opinion and electoral behavior, and the effect of electoral rules and districting decisions on representation.

231. Money in Politics. Seminar examines the role of money in the U.S. political process, including the historical development of campaign finance law, the electoral effects of campaign spending and contributions on public policy outcomes, and various reform proposals.

237. Domestic Social Policy. Introduces the content, rationale, assumptions, and development of selected domestic policies.

238. Business and Politics. Examines how corporations affect and are affected by politics. Topics include regulation, lawmaking, campaign finance, the mass media, and interest group mobilization.

239. The Nature and Foundations of Entrepreneurship. Looks beyond traditional concepts and considers actions which transform ideas into enterprises that generate intellectual, social, cultural, religious, or economic value. Uses theory, data, case studies, and guest speakers to investigate the meaning of "entrepreneur" and what characterizes the entrepreneurial society.

241. Urban Change and City Politics. Seminar examines the politics and history of American cities. The course emphasizes the ways in which ethnicity, race, and class shape battles over housing, neighborhoods, workplaces, schools, and governmental institutions. Same as HIS 260.

243. Environmental Politics. An examination of environmental problems and issues from a social scientific perspective.

245. Aging and Public Policy. Covers policies in such areas as social security, public assistance, health care, and social services for the elderly.

249. Sports and the American City. Examines the relationship between sports and American urban life. Same as HIS 261.

291. The First Amendment and Religion in America. Closely examines key aspects of the First Amendment to the U.S. Constitution, with particular attention to the issue of freedom of religion.

COMPARATIVE POLITICS

101. Introduction to Comparative Politics. Introduces students to a wide variety of political institutions, processes, and outcomes in countries across the globe. Same as IR 101.

250. Conflict in Democracies. Why are some democracies able to keep political conflict within constitutional boundaries while others are not? Theories about the political setting and theories of choices made by citizens and leaders are used to explore the nature of democratic conflict. Same as IR 250.

253. Comparative Political Parties. Focuses on political parties in the comparative context, comparing and contrasting the strengths and weaknesses of parties in an evolving political order. Same as IR 253.

256. Theories of Comparative Politics. Introduces theories in the field of comparative politics and explains how the national and international environment, the political culture, the political institutions, and the choices of citizens and leaders affect political per-

formance. Explains democratization, stability, competition, citizen influence, and policy outcomes as consequences of the environment, culture, and institutions—and human choices in these contexts. Same as IR 256.

258. Democratic Regimes. Surveys the main theoretical and empirical issues around the topic of democratization. Examples are drawn from a broad array of countries in Latin America and Europe. Same as IR 258.

261. Latin American Politics. Introduces the political development and the current context of politics in Latin America with a specific focus on the experiences of Argentina, Brazil, Chile, Peru, and Mexico. Same as IR 261.

262. Globalization Past and Present. This class systematically examines the implications of economic globalization for domestic and international politics. Emphasis is given to the lessons of nineteenth-century globalization for politically relevant issues of the present such as the effect of greater factor mobility on income distribution, economic growth, political coalitions, policy-setting autonomy, and the viability of the welfare state. Same as IR 262.

263. Comparative Law and Courts. Analyzes legal and judicial systems in different countries, with special emphasis on Latin America. Same as IR 263.

264. Comparative Political Institutions. This seminar deals with political institutions and their implications for the behavior of political actors and their effects on social outcomes. Same as IR 264.

267. Identity, Ethnicity, and Nationalism. Draws upon theories from political science, anthropology, sociology, and economics to explore concepts of identity, ethnicity, and nationalism from a comparative perspective. Same as IR 267.

268. Economics and Elections. Examines topics such as how electoral competitiveness and electoral institutions influence taxation, price levels, income distribution, and trade protectionism as well as how change in domestic and international economic aggregates affect the probability of incumbent reelection, opportunistic election timing, and institutional reform. Same as IR 268.

271. Russia and Eastern Europe. Explores the domestic politics and foreign relations of Russia and its East European neighbors, with roughly equal attention to historical and contemporary developments. Same as IR 271.

274. International Political Economy. Presents an overview of the international political economy and the role of nation-states within it. Same as ECO 272. Same as IR 274.

INTERNATIONAL RELATIONS

106. Introduction to International Relations. Surveys theories of international relations, focusing on explanations of conflict and cooperation. The course introduces game theory and illustrates numerous applications in international relations. Same as IR 106.

262. Globalization Past and Present. This class systematically examines the implications of economic globalization for domestic and international politics. Emphasis is given to the lessons of nineteenth-century globalization for politically relevant issues of the present such as the effect of greater factor mobility on income distribution, economic growth, political coalitions, policy-setting autonomy, and the viability of the welfare state. Same as IR 262.

270. Mechanisms of International Relations. Mechanisms play a crucial role in the new conception of theory in the social sciences. This course examines one particular mechanism each week and how it has been applied in international political economy and/or security studies. Same as IR 270.

271. Russia and Eastern Europe. Explores the domestic politics and foreign relations of Russia and its East European neighbors, with roughly equal attention to historical and contemporary developments. Same as IR 271.

272. Theories of International Relations. Surveys approaches to theory-building in international relations, with some emphasis on attempts to explain war and its causes. Same as IR 272.

274. International Political Economy. Presents an overview of the international political economy and the role of nation-states within it. Same as Same as IR 274, ECO 272.

276. Domestic Policy and International Conflict. Domestic institutions affect the way in which political conflict is arbitrated. This course examines basic models of domestic politics and asks whether domestic institutions generate different foreign policies—for example, are democracies more peaceful than dictatorships? Same as IR 276.

279. War and the Nation State. Examines the development of warfare and growth of the state. Same as IR 279.

POSITIVE POLITICAL THEORY

107. Introduction to Positive Political Theory. Through examples drawn from all aspects of the political process—from elections to lawmaking to regulation—studies how the rules of the game affect the decisions poli-ticians make as well as the policy outcomes we observe.

108. Introduction to Political Economy. This course is an introduction to the history of thought and current debates in political economy. Same as IR 108.

272. Theories of International Relations. Surveys approaches to theory-building in international relations, with some emphasis on attempts to explain war and its causes.

280. The Politics of Delegation. This course introduces students to some of the big questions raised by political delegation, and to the basic tools that positive political theorists use to grapple with these questions.

281. Formal Models in Political Science. Introduces the "rational choice" approach to understanding political phenomena. The basics of social choice theory, game theory, and spatial modeling are presented through application to a broad range of political situations.
285. Strategy and Politics. Examines recent descriptive theories of political behavior (including theories derived from the theory of games, social choice theory, and economic models) in order to arrive at a general theory of political strategy. Prerequisite: PSC 202.
286. Political Economy. What determines the size of government, the extent and type of public good provision, the effect of interest groups and lobbying on legislators, and the connection between business and electoral cycles? These are the types of questions that this course addresses.
288. Game Theory. Introduces game theory, which provides a unified approach to understanding social phenomena. Examples of situations to which we will apply the theory include arms races, provision of public goods, competition between firms, electoral campaigns, voting, auctions, and bargaining.

POLITICAL PHILOSOPHY
104. Introduction to Political Philosophy. Examines a range of contemporary political issues and explores the philosophical conflicts and controversies that those issues raise.
108. Introduction to Political Economy. This course is an introduction to the history of thought and current debates in political economy. Same as IR 108.
121. Democracy in America. Democracy literally means "rules by the people." This definition raises various questions, which are explored in the context of twentieth-century American politics.
221. Philosophical Foundations of the American Revolution. This course examines the philosophical foundations of the American Revolution by examining the political theory that lies behind the revolution itself and that underlies the foundations of the Constitution. Same as PHL 221.
282. Art and Politics. Draws on art history, literature, and political theory to explore the ways that politics and the practices of artistic representation intersect. Much of the course treats questions of race and identity.
283. Contemporary Political Theory. Explores themes of reason and sovereignty in political thought from the late eighteenth century through the present.
284. Democratic Theory. Focuses on various topics in democratic theory, such as the relation between democracy and other basic political principles (liberty, equality, justice), whether democratic institutions should be aggregative or deliberative, and the role of referenda, lotteries, and new telecommunications technology in democratic decision making.
291. The First Amendment and Religion in America. Closely examines key aspects of the First Amendment to the U.S. Constitution, with particular attention to the issue of freedom of religion.
292. Rousseau to Revolution. In this course students study the political philosophy of Rousseau and the French Revolution. Same as PHL 324.

ASSOCIATED COURSES AND ELECTIVES
240. Criminal Procedures and Constitutional Principles. Examines statutory and constitutional criminal procedure issues.
246. Women in Politics. Examines the participation of women in American political life.
248. Politics of the Middle East. This course introduces students to the contemporary politics of the Middle East from both comparative politics and international relations perspectives.

INDIVIDUALIZED RESEARCH COURSES
389. Junior Honors Seminar. (Spring)
390. Supervised Teaching.
391. Independent Study. Work beyond the regular course offerings done by arrangement between students and full-time faculty.
392. Practicum.
393. Senior Honors Project. Yearlong independent project, working one-on-one with faculty member. (Fall and Spring)

INTERNSHIPS
394. Local Law and Politics Internships. Most internship placements are in the district attorney's or public defender's offices. Occasionally one or two other law placements are available. Students may also propose an alternative political or law placement.
396. Washington Semester Program. One semester's work in Washington, D.C., as a member of the staff of a U.S. senator or representative.
397. European Political Internships. Internships are available for students in Edinburgh, London, Brussels, Bonn, Berlin, and Madrid. Internships are in English in Edinburgh, London, and Brussels; students need proficiency in the language for the latter three placements. For applications and information, students should contact the Study Abroad Office in 206 Lattimore.

Courses for the concentration in international relations are drawn not only from offerings in political science, but also from anthro-

pology, comparative literature, economics history, philosophy, and religion and classics. All students in the concentration take core courses in comparative politics and international relations, a set of courses in a specialized track (either Global Security, Political Economy and Development, or Governance of Nations), and electives. The full set of courses in international relations can be found on the department Web site at www.rochester.edu/college/PSC.

PSYCHOLOGY

Programs in psychology, including the major, the minors, and the CSSP clusters, are administered by the Department of Clinical and Social Sciences in Psychology (CSSP). Courses in psychology—designated PSY courses—are offered by CSSP and by BCS (the Department of Brain and Cognitive Sciences), and most PSY courses carry cross-listings as either CSP or BCS courses.

Instruction is offered throughout the broad spectrum of behavioral science. Its content covers theoretical, empirical, and technical presentations of psychology as both a social and natural science. Applications to health and helping professions and to business are common themes. Student experiences may range from large lecture courses with smaller discussion sections to individual laboratory, prac-ticum, and internship situations. Undergraduates may register for graduate-level courses with permission of the instructor. Programs may be tailored to provide excellent background for postgraduate work in psychology, medicine, education, social work, law, business, and other related social and natural sciences as well as to occupations in business and human services.

Students planning to pursue graduate studies in psychology are advised to seek a broad foundation in psychology, an informed depth in their field of interest, and a working focus on the research literature and research methodologies. These students are also encouraged to take active roles in the ongoing research of faculty, the Undergraduate Psychology Council, and the local chapter of Psi Chi, the national honorary society in psychology.

GENERAL COURSE INFORMATION

An Introduction to Psychology course is a prerequisite for declaring the major and a requirement in the minors in psychology. It may be waived for students who receive a score of 3 or higher on the Advanced Placement psychology examination. A score of 4 or 5 on that examination will earn college credit for PSY 101. There is also a placement examination offered through the College Center for Academic Support. PSY 101 as a prerequisite or requirement is waived upon passing this exam.

Students taking psychology courses as part of a psychology degree should register for those courses under PSY.

THE INTRODUCTORY COURSE

PSY 101, Introduction to Psychology, is a balanced and in-tegrated survey of psychology with coverage of both social and natural science domains. Sections of PSY 101 vary, but most consist of lectures, readings, discussions, and demonstrations. One fall section is limited to freshmen only. (Fall and Spring)

CORE COURSES IN PSYCHOLOGY

Core courses in psychology present surveys of their specific areas. They enter into the requirements for the major and the minors in psychology. The current core courses are

- PSY 110. Neural Foundations of Behavior
- PSY 112. Cognitive Psychology
- PSY 113. Biopsychology of Social and Clinical Behaviors
- PSY 161. Social Psychology and Individual Differences
- PSY 171. Social and Emotional Development
- PSY 181. Theories of Personality and Psychotherapy

PSYCHOLOGY COURSES OFFERED BY CLINICAL AND SOCIAL SCIENCES IN PSYCHOLOGY

All courses beyond PSY 101 offered by this department are cross-listed as CSP and PSY. See the Department of Clinical and Social Sciences in Psychology for course descriptions (page 51).

PSY 101. Introduction to Psychology

PSY 113. Biopsychology of Social and

Clinical Behaviors
CSP 161. Social Psychology and Individual Differences
CSP 171. Social and Emotional Development
CSP 181. Theories of Personality and Psychotherapy
CSP 209. Psychology of Human Sexuality
CSP 211. Introduction to Statistical Methods in Psychology
CSP 219W. Research Methods in Psychology
CSP 262. Human Motivation and Emotion
CSP 263. Relationship Process and Emotions
CSP 264. Industrial andOrganizational
Psychology
CSP 266. Research Lab in Social Psychology
CSP 267. Psychology of Gender
CSP 278. Adolescent Development
CSP 280. Clinical Psychology
CSP 281. Psychology and Law
CSP 282. Abnormal Psychology
CSP 283. Behavioral Medicine
CSP 289. Developmental Child Psychopathology
CSP 301. Teaching Psychology
CSP 309. Honors Seminar
CSP 310–311. Honors Research I & II
CSP 361. Social Psychology: Self-Concept
CSP 364. Achievement and Motivation
CSP 366. Social Psychology and Control
CSP 367W. Gender and Mental Health
CSP 368W. Seminar in Humanistic Psychology
CSP 371. Seminar in Social and Personality Development
CSP 373–374. Exploring Research in Social Psychology I & II
CSP 375. Advanced Topics: Relationships and Emotions
CSP 376. Seminar in Self-Determination
CSP 377. Exploring Research in Family
Psychology I
CSP 378. Exploring Research in Family
Psychology II
CSP 381. Psychology of Developmental Disabilities
CSP 383. Moral Development
CSP 384. Practicum in Developmental Disabilities I
CSP 385. Practicum in Developmental Disabilities II
CSP 388–389. Research Practicum in Developmental Psychopathology I and II
CSP 390. Supervised Teaching in Psychology
CSP 391. Independent Studies in Psychology
CSP 392. Practicum in Psychology
CSP 394. Internship in Psychology
CSP 396. Special Topics in Psychology

PSYCHOLOGY COURSES OFFERED
BY BRAIN AND COGNITIVE SCIENCES

All courses below are cross-listed as BCS and PSY. See the Department of Brain and Cognitive Sciences for course descriptions (page 44).
BCS 110. Neural Foundations of Behavior
BCS 112. Cognitive Psychology
BCS 151. Perception and Action
BCS 152. Language and Psycholinguistics
BCS 153. Cognition
BCS 172. Development of Mind and Brain

BCS 183. Animal Minds
BCS 200. Experimental Design and Analysis
BCS 205. Laboratory in Development and Learning
BCS 208. Laboratory in Perception and Cognition
BCS 220. The Intelligent Eye
BCS 221. Audition
BCS 228. The Human-Machine Interface
BCS 242. Neuropsychology
BCS 246. Biology of Mental Disorders
BCS 259. Language Development
BCS 261. Language Use and Understanding

REQUIREMENTS FOR THE MAJOR IN PSYCHOLOGY

This major partially fulfills requirements for the B.A. degree.

1. PSY 101 or the equivalent must be completed before the student is accepted into the major.

2. An acceptable statistics course, preferably by the end of the sophomore year. PSY 200, 211, STT 211, 212, or 213 is strongly recommended, although STT 203 may also be used to meet this requirement.

3. In addition to the above, at least 10 courses comprising the following:

a. Two of the three core courses in natural science aspects of psychology: PSY 110, 112, and 113. BCS 111 may be substituted for BCS/PSY 112.

b. Two of the three core courses offered in social science aspects of psychology: PSY 161, 171, and 181

c. Four further PSY courses, NOT including independent studies or Quest courses

d. Two more courses, including independent studies in psychology. These may be PSY courses, or they may be courses in an allied field that inform the student's pursuit of psychology. Allied field courses are frequently bridges to a student's second major or a minor. At the time of declaring the major, the student should be prepared to argue for the appropriateness of the allied field choices.

4. Two of the psychology courses must be designated upper-level writing courses and one of these must be at or beyond the 200 level.

5. Pursuant to College rules, all courses in the major must be completed with a cumulative average of 2.0 (C) or better.

As many as two psychology courses in add-i-tion to the introduction and statistics courses may be transferred into the major from other institutions. Transferred courses into the major must be explicitly approved.

HONORS DEGREE IN PSYCHOLOGY

Students should form the intention and plan to enter the honors program by the first semester of their junior year or before. Success in this program requires commitment to a working engagement with research in psychology. Students in the honors program should secure a faculty mentor early on in their pursuit of the degree. Most students in the honors program intend to pursue graduate study in psychology, and the program is tailored to their preparation for that goal.

Requirements for the honors degree in psychology:

1. Completion of the requirements for the major in psychology and for the honors degree

2. A cumulative grade-point average of 3.3 or better in psychology courses by the beginning of the senior year

3. The student's program must include

a. PSY 219W, Research Methods in Psychology, or other formal laboratory course

b. one 300-level or higher course in psychology

c. PSY 309, Honors Research Seminar, or, if this course is not available, either a second upper-level seminar in psychology or an independent study in psychology

d. PSY 310, Honors Research I, and PSY 311, Honors Research II

e. completion of acceptable senior thesis

MINORS IN PSYCHOLOGY

PSY 101, Introduction to Psychology, or its equivalent is required for all minors. Decla-ration of a minor should be done with a CSSP faculty advisor. A student may complete only one minor in psychology, and may not do both the major and a minor in psy-chology.

1. Psychology

Five courses in addition to PSY 101:

- Three core courses in psychology of which at least one must be a natural science course (PSY 110, Neural Foundations of Behavior; PSY 112, Cognitive Psychology, or PSY 113, Biopsychology of Social and Clinical Behaviors), and one a social science course (PSY 161, Social Psychology and Individual Differences; PSY 171, Social and Emotional Development; PSY 181, Theories of Personality and Psychotherapy)
- Two further courses in psychology (PSY)

2. Psychology as a Natural Science

Four courses in addition to PSY 101:

- At least one natural science psychology core course (PSY 110, Neural Foundations of Behavior; PSY 112, Cognitive Psychology, or PSY 113, Biopsychology of Social and Clinical Behaviors)
- At least one natural science psychology core course (PSY 110, Neural Foundations of Behavior; PSY 112, Cognitive Psychology; or PSY 113, Biopsychology of Social and Clinical Behaviors)
- At least three further natural science psychology courses (PSY 113 and courses cross-listed as BCS courses), at least one of which is numbered 200 level or above. Independent study courses are acceptable.

3. Psychology as a Social Science

Four courses in addition to PSY 101:

- Two of the three social science psychology core courses (PSY 161, Social Psychology and Individual Differences; PSY 171, Social and Emotional Development; or PSY 181, Theories of Personality and Psychotherapy)
- Two further social science psychology courses (CSP/PSY)

4. Organizational Psychology

Four courses in addition to PSY 101:

- PSY 161, Social Psychology and Individual Differences
- PSY 181, Psychology of Personality and Psychotherapy
- PSY 264, Industrial and Organizational Psychology
- One course from the following: PSY 262, Human Motivation and Emotion; any 300-level social psychology (CSP/PSY) seminar, independent study, or practicum in organizational psychology.

5. Health Psychology

Five courses in addition to PSY 101:

- PSY 110, Neural Foundations of Behavior or PSY 113, Biopsychology of Social and Clinical Behaviors
- PSY 181, Theories of Personality and Psychotherapy
- PSY 282, Abnormal Psychology
- PSY 283, Behavioral Medicine
- One course from the following: PSY 289, Childhood Psychopathology; PSY 382, Seminar in Abnormal Psychology; or any advanced biopsychology course, independent study, or other approved course or practicum

6. Clinical Psychology

Four courses in addition to PSY 101:

- At least two of the following three: PSY 181, Theories of Personality and Psychotherapy; PSY 280, Clinical Psychology; or PSY 282, Abnormal Psychology
- One or two courses from the following: PSY 283, Behavioral Medicine; PSY 289, Developmental Child Psychopathology; PSY 368, Semi-nar in Humanistic Psychology; PSY 381, Psychology of Developmental Disabilities; PSY 242, Neuropsychology; or PSY 246, Biology of Mental Disorders; PSY 281, Psychology and the Law.

7. Social and Emotional Development

Four courses in addition to PSY 101:

- PSY 171, Social and Emotional Development
- Three electives from the following set: PSY 278, Adolescent Development; PSY 289, Childhood Psychopathology; PSY 383, Moral Development; PSY 377 (and/or PSY 378), Exploring Research in Family Psychology I (and or II) PSY 381, Psychology of Developmental Disabilities; or PSY 386, Advanced Emotional Development

CLUSTERS

Clusters are offered by both the Departments of Brain and Cognitive Sciences (page 44) and Clinical and Social Sciences in Psychology (page 52). See these departments for information pertaining to the clusters.

UNDERGRADUATE ORGANIZATIONS

The Undergraduate Psychology Council is open to all students interested in psychology. The council organizes or contributes to a number of events each year, such as independent study fairs, graduate study interest meetings, faculty/student social hours, the honors thesis colloquium, and the psychology diploma ceremony.

Psi Chi, the National Honor Society in Psychology, is open to majors or minors who meet Psi Chi's academic requirements.

PUBLIC HEALTH–RELATED PROGRAMS

The study of public health provides a rich intellectual framework for the multidisciplinary study of some of society's most challenging problems.

STEERING COMMITTEE

Theodore M. Brown, Ph.D. (Princeton)
Professor of History, of Community and Preventive Medicine, and of Medical Humanities
Nancy Chin, Ph.D. (Rochester) *Associate Professor of Community and Preventive Medicine, and of Medical Humanities*
Richard Dees, Ph.D. (Michigan) *Associate Professor of Neurology, of Philosophy, of Pediatrics, and of Medical Humanities*
Edwin van Wijngaarden, Ph.D. (North Carolina, Chapel Hill) *Assistant Professor of Community and Preventive Medicine, and of Environmental Medicine and Chair of the Committee*

PUBLIC HEALTH EDUCATION FOR UNDERGRADUATES AT THE UNIVERSITY OF ROCHESTER

With educational programs in the Department of Community and Preventive Medicine that are accredited by the Council on Education for Public Health, a comprehensive set of course offerings on the River Campus, and administrative and faculty support from both the College and the Medical Center, the University of Rochester is well-positioned to provide a successful, interdisciplinary undergraduate program in public health.

Currently four majors in the public health program have been approved by the Faculty Council, and await approval by the NYS Education Department. A fifth major is expected to be implemented shortly. These majors provide students with an opportunity to engage their interests in community health from diverse disciplinary perspectives including natural sciences, social sciences, and humanities. Taken together, this program allows the University to build on existing strengths in the College and Medical Center while integrating and expanding in exciting new ways.

Overview and Goal

The overarching goal of the undergraduate public health program is to educate our students in an interdisciplinary framework of understanding and responding to global, regional, and local public health challenges.

Accordingly, the curriculum integrates a wide array of disciplines that support the field of public health. This integration is apparent across majors by requiring a set of core competencies regardless of the public health major and within each major by incorporating a variety of disciplines that support the research needs of the major. Of the current four majors, three qualify as majors in the social sciences (epidemiology; health policy; health, behavior, and society) and one qualifies as a major in the humanities (bioethics).

Core Competencies

The basic structure of the majors provides every student with a set of core competencies that are presented in a series of three courses in the domain of public health (PH 101, 102) and epidemiology (EPI 101), plus a course in statistics (STT 212) and a course in public health ethics (PHL 228) or medical ethics (PHL 225). Thus, the majors have five core courses in common in addition to those courses required for each distinctive major. These courses provide a broad overview of the general fields of public health and epidemiology; an overview of the U.S. health care system; an overview of the physiologic, cultural, behavioral, and environmental determinants of health and illness; an overview of basic statistical techniques to analyze data generated in public health research; and an overview of the numerous ethical issues that arise in public health practice and research. These courses provide the foundation for understanding the roles of multiple disciplines and professions in the prevention and solution of public health problems.

Upper-Level Writing Requirement
Students will be required to complete two upper-level writing courses within their chosen major.

Typically, upper-level writing courses include at least one term paper in which a student performs a critical literature review or writes a study protocol on a special topic that is related to the course. The instructor provides comments on the review article or study protocol, and the student is required to revise the document at least once accordingly. Revisions are reviewed by the instructor for approval.

Students normally register for the "W" section of a course. For each "W" section offered by Community and Preventive Medicine there is a cap of five students per semester to ensure the quality of the feedback provided by the instructor. For existing College courses that meet the upper-level writing requirement, registration rules will follow those determined by their respective home departments.

Honors and Distinction Program
All majors, with the exception of bioethics, offer an honors program. Accepted students complete a minimum of 12 credit hours in courses designated as "honors courses." These courses must include at least one advanced course designated with an "H" and 8 credit hours of independent study during which an adequate Senior Thesis or research project is completed. The 8 credit hours of independent study are in addition to the number of credits required for the major.

In addition to the honors program, each major (including bioethics) has a distinction program; the requirements for qualifying for different levels of distinction are the same across all majors. A grade-point average of at least 3.40 in courses submitted for the major will qualify for "distinction," a grade-point average of at least 3.60 in courses submitted for the major will qualify for "high distinction," and a grade-point average of at least 3.80 in courses submitted for the major will qualify for "highest distinction."

Double Majors
Since all majors within the public health program share five core courses, the College's overlap policy precludes students from obtaining a double major within the group of public health majors. Students are permitted to combine a major in public health with a major in another discipline.

THE 3-2 OPTION

The Department of Community and Preventive Medicine in the School of Medicine and Dentistry offers a 3-2 program in public health.

The Master of Public Health (M.P.H) 3-2 Program is open to University of Rochester undergraduates who meet M.P.H. program criteria and are accepted by the M.P.H. Admissions Committee. This highly selective program allows talented undergraduates to get their bachelor's degree and the M.P.H. degree from the School of Medicine and Dentistry in five years, a savings of one year over the typical
"4 plus 2" years if the two degrees were pursued sequentially.

Applicants apply in the spring of their junior year of college, with applications reviewed by the M.P.H. Admissions Committee after the applicants' second semester junior year grades are available. Successful applicants spend their senior year of college taking first-year M.P.H. courses, and the following year—year five—they complete the M.P.H. requirements and receive the M.P.H. degree.

Becoming M.P.H. students in the 3-2 program is appropriate for mature college students with excellent academic credentials and significant "real world" experience who make a strong case that the M.P.H. degree is consistent with their career goals. Potential 3-2 applicants are strongly advised to discuss the 3-2 program with their undergraduate advisor as well as with the director of the M.P.H. program. Early planning for the 3-2 program is essential as applicants must demonstrate completion of all undergraduate requirements before beginning a graduate program in what is their senior year of college. We urge special consideration to whether the potential applicants might get more from the M.P.H. program if they postponed it until after college, other graduate study, and/or work experience. Additionally, undergraduates who are heavily involved in campus activities should give serious consideration to postponing graduate study until after their senior year, since the demands of first-year M.P.H. study presuppose a high level of commitment to graduate program requirements.

The M.P.H. 3-2 program allows students to apply credits from the M.P.H. program towards the remaining number of credits they need for their undergraduate degree. Students wishing to apply for the M.P.H. 3-2 program should submit their application materials after they have their junior year spring semester grades. The application deadline is June 1. The applications are reviewed, and if the Admissions Committee decides in favor of the applicants, the applicants are notified that they will be considered for the M.P.H. 3-2 program, essentially an informal acceptance into the program. However for purposes of registration and financial aid, the students would be considered as students in the College. They take M.P.H. courses in what is their senior year; permission is extended for all courses that require our faculty members' agreement. At the end of that year, the student is formally admitted into the M.P.H. program. In what is the students' second year of M.P.H. courses, they become graduate students in the medical school, and complete all M.P.H. requirements during that year.

Students must make special arrangements to complete their senior year requirements. Because first-year M.P.H. 3-2 students must begin the M.P.H. program with at least 12 credits per semester (most graduate courses carry 3 credits), it is not feasible to overload at the same time with courses necessary to complete undergraduate requirements.

Admission to the 3-2 M.P.H. program is highly selective. In addition to strong Graduate Record Examination scores, the Admissions Committee looks for an accomplished academic record and demonstrated commitment to pursue graduate study. Community service, work experience, and participation in research relevant to public health are all considered favorably by the Admissions Committee. Strong endorsements by referees who know the applicants in both academic and noncurricular settings are also most helpful to the committee. Furthermore, because the M.P.H. student body is predominately composed of adult students, the Admissions Committee looks for 3-2 applicants who have a high level of self-confidence and can "hold their own" in a diverse group of adult learners. Applicants' decision to withdraw a 3-2 application in favor of an additional year of college or to gain work experience will be viewed without prejudice by the Admissions Committee if the applicants reapply at a future time.

For further information, contact Nancy P. Chin, Ph.D., M.P.H., Associate Chair for Education & Director, M.P.H. Program, Department of Community and Preventive Medicine, School of Medicine and Dentistry, 601 Elmwood Ave. Box 644, University of Rochester, Rochester, NY 14642-0001. Phone: (585) 275-9780, fax: (585) 461-4532. Nancy_Chin@urmc.rochester.edu.

RELIGION AND CLASSICS

Douglas R. Brooks, Ph.D. (Harvard) *Profes-sor of Religion and Chair of Committee on Asian Studies*
Th. Emil Homerin, Ph.D. (Chicago) *Professor of Religion*
Paul Muller-Ortega, Ph.D. (California, Santa Barbara) *Professor of Religion*
Edward Wierenga, Ph.D. (Massachusetts) *Professor of Religion and of Philosophy; Chair of the Department*
Daniel Beaumont, Ph.D. (Princeton) --
Asso-ciate Professor of Arabic Language and Literature
Nicholas Gresens, M.A. (Tufts) *Lecturer in Classics*
Curt Cadorette, Ph.D. (University of St. Michael's College) *Associate Professor of Religion and John Henry Newman Associate Professor of Roman Catholic Studies*
Alfred Geier, Ph.D. (Johns Hopkins) *Associate Professor of Classics*
Elizabeth Colantoni, Ph.D. (Michigan)
Assistant Professor of Classics
Nora Rubel, Ph.D. (North Carolina, Chapel Hill) *Assistant Professor of Religion*
*Tamar Fix, Post B.A. Professional Certificate (Hebrew University) *Senior Instructor in Hebrew*
Anne Merideth, Ph.D. (Princeton) *Senior Lecturer in Religion*
*Catherine Beaumont, B.A. (University of Washington) *Lecturer in Arabic Language*
William Scott Green, Ph.D. (Brown) *Professor Emeritus of Religion, Philip S. Bernstein Professor Emeritus of Judaic Studies*
Grace G. Harris, Ph.D. (Cambridge)
Professor Emeritus of Anthropology and of Religion

In the Department of Religion and Classics students explore the great, classical civiliza-tions of West and East and the major religions that emerged from them. The department offers programs of study in the history and philosophy of the world's major religions, in Greek, Latin, Hebrew, Sanskrit, and Arabic languages and literatures, and in ancient Mediterranean and Asian civilizations. Through the study of important classical, biblical, and religious writings, either in the original language or in translation, students critically examine the beliefs, ideas, values, rituals, and traditions that have shaped Western and Asian cultures and study the ways these have persisted and changed from ancient to contemporary times.

REQUIREMENTS FOR CONCENTRATION IN RELIGION

The goal of a concentration in religion is to achieve an understanding of the nature of diverse religions, and the methods employed in their study and to achieve a measure of competence within a specific tradition or area. Seminars, reading courses, and the senior tutorial allow intensive study of particular topics. Students also may enroll in selected courses at Colgate Rochester Divinity

School/Bexley Hall/Crozer Theological Seminary and take advantage of its distinguished theological library.

A minimum of 10 courses is required:
1. Either REL 101 or 102.
2. One course in the history of a tradition, either REL 103, 104, 105, 106, 107, or 108.
3. REL 293, normally taken in the junior year.
4. Six other courses, no more than three of which may focus on the same religious tradition.
5. Senior Thesis (REL 393), or Senior Seminar (REL 389).

A concentration in religion may include no more than three courses below 110.

Since knowledge of a foreign language is fundamental to the study of religion, majors in religion are strongly encouraged to study a language relevant to their area of interest.

HONORS IN RELIGION
1. Eight credits of honors coursework with a grade of at least B+ selected from the following honors courses:
- REL 293. Theories of Religion
- REL 389. Senior Seminar
- REL 390. Supervised Teaching
- REL 392. Honors Research. Independent study taken as preparation for writing the senior thesis.

2. REL 393. Senior Thesis
3. A successful oral defense of the thesis.

MINOR IN RELIGION
1. Either REL 101 or 102.
2. One course in the history of a religious tradition, either REL 103, 104, 105, 106, 107, or 108.
3. REL 293.
4. Three other courses in religion, selected in consultation with the student's advisor in the department.

REQUIREMENTS FOR
CONCENTRATION IN CLASSICS
The concentration in classics is language-centered. Coursework in Greek and Latin is supplemented by studies in ancient literature, religion, philosophy, history, art, and archaeology. The goal of the concentration is to be able to analyze and interpret significant texts in the ancient languages and to understand their cultural context. Students may choose a concentration in classics (both languages), or in Greek or Latin alone; all majors, however, are encouraged to take at least one year of each language, if possible.
A minimum of 11 courses is required, including:
1. At least six language courses numbered 103 or above.
2. A course focusing on the history of the ancient world, e.g., CLA 102, 115.
3. A course focusing on the philosophical writings of the ancient world, e.g. CLA 142, 202.
4. A course surveying the literature and/or mythology of the ancient world, e.g. CLA 135, 140.
A senior project is required, demonstrating the student's ability to meaningfully interpret an ancient text or texts, read in the original language; it may be completed as part of a senior thesis or in conjunction with the junior/senior seminar or other appropriate course.

MINOR IN LATIN
Six courses in Latin; may include LAT 101 and 102.

MINOR IN GREEK
Six courses in Greek; may include CGR 101 and 102.

MINOR IN CLASSICAL CIVILIZATION
Six courses are required, including:
1. A course focusing on the history of the ancient world, e.g., CLA 102, 115.
2. A course surveying the literature and/or mythology of the ancient world, e.g., CLA 135, 140.
3. Four additional courses, which may include language courses as well as courses in translation; 101 and 102 courses in the languages may count.

MINOR IN ARABIC
1. ARA 101 and 102, or the equivalent.

2. Four courses of close textual analysis and interpretation, chosen from a wide range of Arabic texts, and read in the original language.

UPPER-LEVEL WRITING REQUIREMENT

The Department of Religion and Classics is committed to teaching students to think critically, read closely, and write in a clear and cogent style. The department requires students concentrating in religion or classics to undertake a significant amount of writing in courses contributing to their major. As a result, the upper-level writing requirement will be fulfilled by virtue of completing the requirements for either a concentration in religion or a concentration in classics.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

RELIGION

101. Introduction to the Old Testament. Examination of the texts of the Old Testament/Hebrew Bible in their religious, historical, and literary contexts.

102. Introduction to the New Testament. Examination of the texts of the New Testament and other ancient sources in their religious, historical, and literary contexts.

103. History of Judaism. An introduction to Jewish history, with a focus on texts, traditions, practices, and beliefs. Same as JST 203.

104. History of Christianity. A study of the development of Christianity throughout its 20 centuries of existence.

105. Asian Search for Self. A study of the basic teachings of Hinduism and Buddhism on the nature of the cosmos, human existence, and life's ultimate goals.

106. From Confucius to Zen. The teachings, practices, and social impact of the major religious traditions of China and Japan.

107. History of Islam. An introduction to the religion of Islam from its origins in the Qur'an and Muhammad's teachings, through the codification of the Classical tradition in its various forms, and finally, to the living Islam of the contemporary world.

108. Hinduism: An Introduction. An introduction to the thought and practice of Hinduism. Focus is on Hindu deities, ritual practices, temple worship, pilgrimage, and popular practice of Hinduism.

ADVANCED-INTRODUCTORY
THEMATIC COURSES

111. Philosophy of Religion. Historical and recent readings are used to analyze issues such as: existence of God, divine attributes, the relation of God to the world, and faith and reason. Same as PHL 111.

135. Classical Mythology. Introduction to the major myths of the Classical gods and heroes using readings in translation and visual images. Same as CLA 135.

140. Classical and Scriptural Backgrounds. The great tradition, from Homer, Greek drama, Plato, and Virgil to the Bible and Dante. Same as ENG 112, CLA 140.

148. Arabian Nights. *The Arabian Nights*, a classic of world literature, is discussed in terms of the major themes—love and sex, comedy and adventure—that have given the stories their universal appeal and their timeless relevance. The readable English translation of Powys Mathers is used, and classes are mostly devoted to discussion.

151. The Blues. The Blues traces the development of the prewar blues and the postwar transformation of the music. Questions of race and gender are addressed with reference to the lyrics and the lives of prominent musicians (as described in their own words when possible).

155. History of Religion in America. The multiple layers of the American religious experience from Native American religions to Protestant and Catholic Christianity to Judaism and Mormonism.

157. African-American Religious History. Religion is an integral part of the lives and history of the peoples of the African Diaspora. Peoples of African descent in the Americas from the beginnings of slavery to the present have both embraced and contested religion, and it is this historic tension between African Americans use and experience of religion as both oppressor and liberator that forms the foundation of the class.

162. Mysticism. An examination of mystical experience and the quests for it. Ancient and modern views of the subject will be considered as well as mysticism's impact on religion, art, and society.

164. Death, Dying, and Beyond. A study of death and after-death states especially as described in the Asian traditions. Focusing on the Tibetan bardo or "between" state, the course explores how ideas about death shape the evolution of cosmologies, the construction of personal identity, and notions of ultimate meaning and transcendence.

167. Speaking Stones. An examination of grave stones and funerary architecture in Rochester's Mt. Hope cemetery with a focus on symbolic connections among the living and the dead.

171. Storytelling in Indian Religions. This course focuses on a wide variety of stories taken from the Hindu, Buddhist, and Jaina

religious traditions.

188. The Burned over District: -Nineteenth-Century Religion in Western New York. Charles Finney named the region of Western New York the "Burned over District" for the proliferation of religious fervor that swept this section of New York State. The course covers religious movements formed in the area surrounding Rochester, including Jehovah's Witnesses, Mormons, Millerites, and the Onieda community.

QUEST COURSES

190Q. Dante's *Divine Comedy*. Same as IT 190Q.

192Q. Quest for the Historical Jesus. Study of the figure of Jesus and the attempts of the earliest Christians and modern scholars to reconstruct his life and teachings. Readings include parts of the New Testament, gnostic gospels, and modern scholarship. Same as CLA 192Q.

INTERMEDIATE COURSES

Religion in the Ancient World

202. Plato: Relationship Between Drama and Thought. A close study of several Platonic dialogues (*Phaedrus*, *Lysis*) and their themes, especially the relation of eros and speech to divinity. Same as CLA 202.

207. Women in Early Christianity. This seminar examines ancient Christian sources from the first four centuries CE that focus on women's lives and women's religious experiences.

208. Medicine, Magic, and Miracle in the Ancient World. Study of the concepts of disease and of healing practices in antiquity among Christians and pagans, the rise of the medical profession, and contemporary and ancient debates about science, magic, and religion.

211. Jews, Pagans, and Christians in the Ancient World. Study of the complex relations between Jews, Gentiles (pagans), and Christians in antiquity. Particular attention is paid to the problem of the origins of anti-Semitism.

Judaism

209. Judaism in the Ancient World. Study of Second Temple Judaism focusing on the problem of foreign oppression and assimilation, the importance of the Torah and the rise of the scribe, emergence of apocalyptic literature, the Dead Sea Scrolls, and the emergence of Rabbinic Judaism.

214. Imagining the Jew. This course examines popular representations of Jews and the subsequent effects on Jewish acculturation, Americanization, and continuity.

216. Jews and Multiculturalism in America. An examination of Jewish immigration in the United States and the ways in which these immigrants chose to acculturate.

218. The Holocaust. A historical, theological, and ideological analysis of the Holocaust—the ghettos, death camps, and resistance. Same as JST 218 and HIS 206.

220. Jewish Women's Writings. This seminar traces the American Jewish experience, from the Eastern European immigrant experience to the recent religious revival, through the lens of Jewish women's literature. Same as JST 220.

Christianity

226. Martin and Malcolm in America: Religion in the Civil Rights Movement. This course explores the religious biographies of Martin Luther King Jr. and Malcolm X, placing their lives in comparison to the broader civil rights movement and the roots of religious motivation and dissent that fueled the ferment of change.

227. Ancient Christianity. Thematic study of early Christian history and literature focusing on issues of central concern to ancient Christians: "problem" of women in the church, martyrdom and persecution, orthodoxy and heresy, and tensions between Christians and Jews.

228. Sex and Death: The Body in Early Christianity. Examination of the central role of the body in early Christian thought and practice focusing on the issues of sexuality and asceticism, disease and healing, and death and resurrection.

230. Augustine, Anselm, and Aquinas. Three formative philosophical treatments of religious belief are compared on selected topics such as freedom, providence, and the problem of evil. Same as PHL 268/468.

231. Christian History I. An examination of the origin and evolution of Christianity, juxtaposing Christian belief and behavior with the historical environments.

232. Christian History II. A focus on the relationship between Christianity and its social environments from the late Middle Ages to the modern world with special focus on the Reformation, Enlightenment, and present moment.

233. Catholicism and the Social Order. This course examines how the Catholic tradition understands its relationship to the social order—past and present. First we examine classic Catholic ideas about the historical realm, focusing on the writings of Paul, Augustine, and Thomas Aquinas. We explore the relationship between Catholicism and the modern world from the Reformation to the post–Vatican II church. We rely on both institutional documents and the ideas of contemporary Catholic writers concerned with

the modern social order.

234. Cry Freedom: Liberation Theologies of Africa and the Americas. The course examines various theologies of liberation including writers from South Africa, Latin America, and men and women from North America. Same as AAS 246.

235. Religion and Society in Latin America. This course examines the relationship between religion and various Latin American societies, past and present. Although it pays particular attention to the Christian tradition, indigenous religious systems are also examined.

236. Catholicism in American Life. A study of the development of Catholicism from broadly cultural perspectives; political, social, economic, artistic, philosophical, and theological elements are considered of American Catholicism's story.

237. Peru in Depth. This is a University of Rochester Study Abroad Summer Program focusing on the cultural, political, socio-economic, and religious nature of Peru, offering students insight into one of Latin America's most complex and fascinating countries.

239. Religious Right in America. This course looks at how Evangelicals and Fundamentalists have shaped and confronted the American religious landscape, forming their own unique perspective on American life.

Islam

240. Muhammad and the Qur'an. The course studies the prophet Muhammad, the Qur'an, and their importance to medieval and modern Muslim culture. The prophet's life and major themes of the Qur'an will be discussed together with interpretations of them found in Islamic legal, theological, philosophical, and mystical writings.

241. Qur'anic Arabic. Study of the Arabic of the Qur'an—its vocabulary, grammar, and syntax. All primary readings in Arabic and drawn from the Qur'an. Prerequisite: completion of ARA 102 or equivalent; previous or concurrent enrollment in REL 240 is highly recommended though not required. Same as ARA 241.

243. Islamic Mysticism. An advanced introduction to mystical life in Islam which studies mystical experience and theory and traces the importance of Islamic mysticism to religion, philosophy, art, and literature as found in medieval and modern Muslim societies.

244. Islamic Mystical Poetry. In this course students read and analyze Islamic mystical verse in English translation largely from Arabic, Persian, Turkish, and Urdu. Following an intensive introduction to Islamic mysticism, specific poems are studied with particular attention given to the religious contents and functions of this verse and to its place within its respective poetic tradition.

247. Islam and the Third World. An examination of the important and often dramatic changes occurring in modern Islam in context of Third World political, social, and economic factors. Same as AAS 278.

Hinduism

250. Shiva and Shakti. Study of the Divine Couple, the Great God of Hinduism and his consort, through myth, poems, stories, artistic forms, temples, and Tantric philosophies.

255. Hindu Goddesses and Women. We consider the ways in which women understand themselves as Hindus and the ways in which they have been understood. Same as WST 249.

257. Hindu Philosophy. An examination of the six classical systems of philosophy and their aftermath.

259. Hindu Mystical Poetry. This course concentrates on close readings of translations of mystical poetry written in the Hindu tradi-tion both in Sanskrit and in vernacular languages.

260. Hindu Ascetics, Mystics, and Doctors. A close study of Hindu traditions focused on the theories and practices of esoteric Yoga, Tantra, and medicine.

261. Hindu Tantric Yoga. Two texts of Kashmiri Shaivism serve as a focus for an advanced introduction to the mysticism of the Hindu Tantras. Additional readings explore its historical and philosophical dimensions.

270. Medicine, Alchemy, and Religion in India. An introduction to the Indian traditions of medicine, healing, and self-transformation from historical, theoretical, and practical perspectives.

271. Medieval Hindu Philosophy.
Studies in Vedanta, Kashmir Saivism, and other systems of thought.

272. Classical Yoga Traditions of India. A sustained study of the third-century meditation and Yoga text, the Yoga Sutra of Patanjali, and its related commentarial literatures, history, and religious significance.

Buddhism

264. Buddha, Meditation, Nirvana. An introduction to Buddhism: its founder and early origins; its sacred literature and evolution; with a particular focus on the role of early Buddhist meditation practices.

266. Buddhist Philosophers, Poets, and Siddhas. An introduction to major developments in Buddhist thought and practice by considering key figures in Indian, Tibetan, and East Asian traditions.

269. Tibetan Buddhism. A critical examination of the development of Buddhism in Tibet.

Religion in Art and Literature

238. Native American Art and Religion. Same as AH 280.
279. Romanesque Art and Architecture. Same as AH 238W.
281. British Art of the Middle Ages. Same as AH 240.
282. The Arts of Buddhist Asia. Same as AH 226.
288. Chaucer. Same as ENG 206/406.

METHODOLOGICAL AND PHILOSOPHICAL COURSES

290. Race, Religion, and Genocide in the Twentieth Century. Course investigates some of the major events of the twentieth century that have perpetrated presuppositions about the nature of God, humanity, and perfection and that rely on the persecution of the "Other," with the goal of understanding how religious motivations can turn to destructive ends.
291. Topics in Philosophical Theology. A seminar devoted to a selected topic in philosophy of religion. Same as PHL 260/460.
293. Theories of Religion. Credit—6 hours. An investigation of important methodological contributions to the critical study of religion. Restricted to religion majors and minors.
294. Religion, Gender, and the Body. This course interrogates the role of religious belief in forming, shaping, and transforming understandings of the body and gender in the world's major religious traditions.
295. Religions and Society. Same as ANT 263.
297. Freedom and the First Amendment. A close examination of key aspects of the First Amendment to the U.S. Constitution, with particular attention to the issue of freedom of religion.

Archaeology

200. Introduction to Archaeology. An examination of the methods and theoretical approaches of archaeology, and a comparative investigation of material culture and patterns of colonization in the ancient Mediterranean and early America.
299. Field Methods in Archaeology. Credit—6 hours.

ADVANCED COURSES AND SEMINARS

310. Seminar in Mahâbhârata. A study of the *Mahâbhârata*, the great Hindu epic, focusing on the symbolism of its narrative and the problems involved in its interpretation of myth and ritual.
312. Seminar in Zen Buddhism. A focused examination of the intellectual and historical origins of Zen Buddhism, including works from Basho, Dogen, and Nishitani.
315. Lived Religion in America. This course both considers the literature and theoretical engagements of the study of "Lived Religion" in the American context, and provides students with both a theoretical basis of lived religion, as well as introduction to texts and ethnographies that address the complexity of "Lived Religion."
389. Senior Seminar. Topics, methods, and theoretical models in the study of religion. Restricted to senior religion majors.
390. Supervised Teaching.
391. Independent Study.
392. Honors Research.
393. Senior Thesis. A directed, individual study project open to senior concentrators.
394. Internship.

ARABIC

101. Elementary Arabic I. An introduction to Modern Standard Arabic including the alphabet, pronunciation, vocabulary, grammar, elementary conversation, and reading. (Fall)
102. Elementary Arabic II. Continuation of ARA 101. (Spring)
103. Intermediate Arabic I. Readings, drills, and continued study of grammar.
104. Intermediate Arabic II. Continuation of ARA 103.
148. *The Arabian Nights.* *The Arabian Nights*, a classic of world literature, is discussed in terms of the major themes—love and sex, comedy and adventure—that have given the stories their universal appeal and their timeless relevance. The readable English translation of Powys Mathers is used, and classes are mostly devoted to discussion.
149. Contemporary Fiction from the Arab World in Translation. This course introduces the students to major Arab authors of contemporary novels and short stories in excellent translations.
201. Arabic Prose Seminar I. Intensive readings to increase vocabulary. Weak verbs and conditional sentences complete the study of grammar.
202. Arabic Prose Seminar II. Contemporary short stories from the Arab World in Arabic. The class is designed to expand students' vocabulary and improve the speed with which they read literary Arabic.

203. Arabic Prose Seminar III. Content varies; offered upon request.
241. Qur'anic Arabic. Same as REL 241.

GREEK
NOTE: Greek 101 and 102, or the equivalent, are prerequisites to all Greek courses at the 200 level.
101. Classical Greek I. An introduction to Greek designed to prepare students to read the Classical Greek dramatists, philosophers, orators, and historians, and the New
Testament. (Fall)
102. Classical Greek II. Continuation of GRK 101. (Spring)
103. Intermediate Greek. Review of Greek grammar and readings in an unadapted prose text.
202. Homer's *Odyssey*. Selections from the *Odyssey* of Homer read in Greek. The entire *Odyssey* read in English and discussed.
206. Plato's *Phaedrus*. Study of the lan-guage and thought of the *Phaedrus*. (Spring)
209. Plato's Meno. Translation and close study of Plato's Meno. Skill in translating and advancement of the knowledge of Greek is stressed.
210. Euripides. An exploration of the language and thought of Euripides through a reading of one of his best-known plays—either the *Medea*, *Hippolytos*, *Bacchae*, or *Alcestis*.
391. Independent Study. A study of special literary problems, under the direction of a member of the faculty.
393. Senior Thesis.

HEBREW
101. Elementary Hebrew I. Introduction to the structure of Modern Hebrew. Practice in vocabulary, use, grammar, reading, and writing. Same as JST 101. (Fall)
102. Elementary Hebrew II. Direct continuation of Elementary Hebrew 101 with emphasis on enhancing reading, writing, and speaking skills. Same as JST 103. (Spring)
103. Intermediate Hebrew. Continuation of HEB 102 with emphasis on enhancing reading comprehension and writing and speaking skills. Students are expected to have good understanding of the structure of Hebrew including familiarity with verb forms. Same as JST 104. (Fall)
204. Hebrew through Conversation. A conversational course designed to offer the opportunity to converse and discuss anything in Hebrew, from poetry to politics, depending on the interest of the class.

LATIN
101. Elementary Latin I. An introduction to the Latin language based on the ancient authors and designed to prepare students for the reading of classical and medieval texts. (Fall)
102. Elementary Latin II. Continuation of LAT 101. Prerequisite: LAT 101 or permission of instructor. (Spring)
103. Intermediate Latin. This course, the third in the introductory sequence, consists of readings from a selection of Latin prose and poetry with accompanying grammar review.
204. Catullus. A close study of the poems of Catullus.
206. Virgil's *Aeneid*. A study of Books 1, 2, 4, 6 of Virgil's *Aeneid*, concentrating on translation and interpretation of the work.
207. Lucretius. Selections from Lucretius' philosophical poetry.
210. Cicero. Study of a major oratorical work plus a sampling of the philosophy and letters.
212. Latin Prose Fiction. An introduction to the two longest surviving works of Latin prose fiction, Petronius' *Satiricon* and Apuleius' *Golden Ass*.
213. Imperial Rome. Latin prose and poetry illustrating both the ideology and the day-to-day realities of the Roman Empire.
214. Latin Epistles. A study of letterwriting as a roman literacy practice.
216. Roman Historians. Selections from major Roman historians are read and discussed.
220. Plautus and Roman Comedy. A study and translation of one whole play of Plautus and passages from several others.
221. Medieval Latin. Introduction to a variety of Medieval Latin texts. Students complete independent studies of an author or topic of their choice.
250/450. Latin Skills. This course focuses on the development of listening, speaking, and writing skills for Latin students and prospective teachers.
391. Independent Study. Advanced readings in unadapted Latin texts, by arrangement with the instructor.
393. Senior Thesis.

CLASSICAL STUDIES
102. Cultural History of Ancient Greece. In this course students survey the unique military, political, and economic history of ancient Greece from the Bronze Age to the death of Alexander the Great.

115. Roman World. A comprehensive account of the history of Rome.
135. Classical Mythology. Introduction to the major myths of the Greek gods and heroes using readings in translation and slides of Greek art. Same as REL 135.
140. Classical and Scriptural Backgrounds. Same as REL 140 and ENG 140.
142. The Ideas of the Greeks. A study of the major literary, philosophical, religious, and historical themes, and ideas from Homer to Aristotle.
200. Introduction to Archaeology. An examination of the methods and theoretical approaches of archaeology.
201. Archaeology of Comparative Colonization. A comparative investigation of material culture and patterns of colonization in the ancient Mediterranean and early America. Same as HIS 224.
202. Plato: Relationship between Drama and Thought. Same as REL 202.
204. Engineering and Society in Classical Antiquity. This course explores the relationship between, on the one hand, engineering and technological advances and, on the other hand, social practices in ancient Greece and Rome. Topics covered include the social role of engineers and architects, the ancient economy and work force, and the social use of buildings and other constructions in the Greek and Roman worlds.
213. Roman Structures: Engineering in the Classical World. A study on location of Roman engineering focused primarily on civil engineering structures, but also including topics in mechanics, hydraulics, and materials. Same as ME 105.
214. The Ancient City. An examination of urbanism in the ancient Mediterranean world focusing on the cities and colonies of ancient Greece and of the Roman Empire.
220. Greek Art and Archaeology. An examination of the physical remains of ancient Greek civilization, with an emphasis on architecture, sculpture, painting, and other visual arts, in order to understand Greek culture and society.
221. Roman Art and Archaeology. An examination of the physical remains of ancient Roman civilization, with an emphasis on architecture, sculpture, painting, and other visual arts, in order to understand Roman culture and society.
250. Ethnic Indentity in Ancient Greece and Rome. This course explores theories about the roles of race, language, and culture in the construction of identity and the relative usefulness of historical and archaeological methodologies in attempts to understand past conceptions of identity.
389. Junior/Senior Seminar. A seminar in which advanced students in classics design and present their own research projects; particular attention paid to methods of research and interpretation.

RUSSIAN STUDIES

Kathleen Parthé, Ph.D. (Cornell) *Professor of Russian; Director of Russian Studies*
John Givens, Ph.D. (University of Washington) *Associate Professor of Russian*
Matthew Lenoe, Ph.D. (Chicago) *Associate Professor of History*
Randall Stone, Ph.D. (Harvard) *Associate Professor of Political Science*
Friederike Seligman, Ph.D. (Michigan) *Assistant Professor of Russian*
Laura Givens, M.A. (University of Washington) *Senior Lecturer in Russian*
Anna Maslennikova, Ph.D. (St. Petersburg) *Senior Lecturer in Russian*

Russian studies offers students a program that incorporates the perspective of several disciplines and the linguistic, historical, and cultural background needed to understand Russia's past, to analyze its present, and to make responsible predictions about its future. The three departments and disciplines providing the core faculty for this program are modern languages and cultures, history, and political science, but a Russian studies major or minor concentration includes courses in or cross-listed with art history, religion and classics, Judaic studies, Polish and Central European studies, film and media studies, women's studies, comparative literature, and economics.

The Russian studies curriculum, like Russia itself, is seen as a work in progress, and new courses are added and old ones revised to reflect new knowledge in this area, and the changing opportunities for graduates of the program. Recent additions to the roster of courses include Russia Now, Secret Nation, Russian Art, Russian Drama, Russia Goes to the Movies, The Image of Christ in Russian Literature, and Russia to 1692. There are numerous co-curricular activities throughout the year designed to meet the needs and interests of majors and minors, but open to the entire College community.

In addition to the course of study on the Rochester campus, students majoring or minoring in Russian studies take part in the one-month summer program in St. Petersburg, or an approved semester-long program in Moscow or St. Petersburg. Each year students are involved in area-related summer or semester internships in Washington, D.C., or Russia. Graduates have gone on to law school and other postgraduate study, to positions in nongovernment and government agencies in Washington, and to U.S. businesses with branches in Moscow and St. Petersburg.

Russia has a history and culture that go back more than a millenium, while its political and economic structures are less than two decades old. The Russian studies program prepares students to not only know about this area, but to work in and with it at this time of transition.

In addition to the Russian studies major and minor, the program also offers clusters in the humanities and one in the social sciences, and several of its courses count towards the major in International Relations. For further information on the Russian major and minor requirements, and on the summer study program in St. Petersburg, consult the Department of Modern Languages and Cultures section in this catalog.

The Russian studies major is an interdisciplinary program designed to provide students with a background in Russia, the former Soviet Union, and Central and Eastern Europe. The course of study is based on a working knowledge of the Russian language, combined with the study of Russian history, literature, film, religion, art, political science, and economics. Successfully completing a major enables students to do independent analysis of events in Russia and surrounding regions.

A major in Russian studies can be designated as belonging either to the humanities or social sciences, depending on the student's interests and course choices. Students frequently combine a Russian studies major with a second major in political science, history, or another discipline.

REQUIREMENTS FOR CONCENTRATION IN RUSSIAN STUDIES

1. Proficiency in Russian, which can be demonstrated in several ways, but which is generally the equivalent of coursework through 152.
2. Two courses in Russian literature and two in Russian history; it is highly recommended that at least one of the literature and one of the history courses be a survey.
3. Two courses in political science which cover basic concepts of international relations or have a specific focus in this area.
4. A senior thesis.
5. Upper-level writing requirement: majors take the writing section of two Russian studies courses or one such course plus the senior thesis.

Language training in Russia is strongly encouraged, either through the University of Rochester's summer program in St. Petersburg, or one of several recommended semester-long programs.

REQUIREMENTS FOR MINOR IN RUSSIAN STUDIES

The minor in Russian studies can be designated as belonging either to the humanities or social sciences, depending on the student's interests and course choices.

The minor requires a reading knowledge of Russian (151 or the equivalent) plus five courses: (a) a survey course in history/culture, *and* a survey in literature (for a total of two courses); (b) one course each in a more specialized area of history, literature, or art (two courses in all); and (c) a course in political science or economics which enriches the study of this region.

COURSES OF INSTRUCTION

In addition to Russian language at all levels, the Russian Studies Program regularly offers the following courses in English. Fuller descriptions are available in the entries for the Departments of History, Modern Languages and Cultures, and Political Science.

CLT 160. The New Europe: Formations and Transformations.
CLT 161. Europe Today.
HIS 151. Imperial Russia.
HIS 152. Soviet Russia.
HIS 155. History of Russia to 1692.
HIS 191. Russian Revolution.
HIS 293. Stalinism.
HIS 330. Russia in East Asia.
PSC 106. Introduction to International Relations.
PSC 271. Russia and Eastern Europe.

PSC 272. Theories of International Relations.
PSC 292. Politics and Economics of Post-Communist Transformation.
RUS 124. Russian Life.
RST 126. Russia Now.
RUS 128. Russian Civilization.
RUS 190Q. Tolstoy's *War and Peace*. Same as RUS 235.
RUS 222. Russian Drama.
RUS 224. Russian Art.
RUS 229. St. Petersburg in Russian Culture.
RUS 231. Great Russian Writers (1830–1930).
RUS 237. Dostoevsky. Same as RUS 191Q.
RUS 238. Solzhenitsyn: Writer, Prophet, Witness
RUS 243. Chekhov and His Contemporaries.
RUS 246. The Image of Christ in Russian Literature.
RUS 247. Secret Nation.
RUS 248. Politics of Identity.
RUS 265. Russian Literature Between Revolutions: 1917–1991.
RUS 267. Russia Goes to the Movies.
RUS 289. Dangerous Texts: Literature and Politics in Russia.

SOCIOLOGY

Dean Harper, Ph.D. (Columbia) *Profes-sor Emeritus of Sociology*
Thomas Spence Smith, Ph.D. (Chicago)
Professor of Sociology
Raymond Murphy, Ph.D. (Northwestern) *Professor Emeritus of Sociology*

Though the College offers several courses in sociology each year, there is no Department of Sociology, and therefore no major or minor in sociology. Students who are particularly interested in sociology and do not wish to major in one of the departmental programs in the College are encouraged to arrange an interdisciplinary major through the College Center for Study Abroad and Interdepartmental Degree Programs (see page 75). Through the Center a program including an emphasis on sociology may be submitted for the approval of the Committee on Individualized Interdepartmental Concentrations. Students who plan on graduate study in sociology should consult one or more of the professors of sociology for advice concerning appropriate undergraduate courses, both in sociology and in other departments.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

INTRODUCTORY COURSES

101. Introduction to Sociology. Social organization of behavior. Status and role. Nature of social groups. Social stratification. Social institutions. (Fall)

SOCIOLOGICAL THEORY

205. Microsociology. Theories of interaction. Analysis of social networks. Small group processes. Social exchange. Conversation and discourse analysis. (Fall)
206. Advanced Microsociology. Theories of interaction. Analysis of social networks. Small group processes. Social exchange. Conversation and discourse analysis. Students may take both SOC 205 and 206. (Spring)

SPECIALIZED COURSES

221. Love, Friendship, and Community. Sociological study of personal ties and face-to-face social groups: kinship networks, friendship groups, political and religious ideological groups, intellectual circles.

262. Medical Sociology. Disease distinguished from illness. Social factors contributing to the onset of disease. Social consequences of disease. Doctor-patient relations. Organization of health care.

SEMINARS AND READING AND RESEARCH COURSES

391. Independent Study in Sociology. Special work individually assigned, with the consent of the department.
392. Directed Research. Individual research projects, done under the supervision of a faculty member.
394. Internship.

STATISTICS

Govind Shrikrishna Mudholkar, Ph.D. (North Carolina) *Professor of Statistics in the Department of Mathematics*
Poduri, S.R.S. Rao, Ph.D. (Harvard) *Professor of Statistics in the Department of -Mathematics; Director of the Program in Statistics*
Charles Heckler, Ph.D. (Rochester) *Adjunct Associate Professor in Statistics*
Maria McDermott, M.A. (Rochester) *Adjunct Instructor in Statistics*
Nicholas Zaino, M.A. (Rochester) *Adjunct Instructor in Statistics*

The major and minor in statistics will be available to students on a case by case basis depending on course availability. For further information, please contact Professor S.R.S. Rao Poduri, Director of the Program in Statistics.

Introduction to statistical methods and applications is provided by STT 211, 212, or 213; to probability by STT 201; and to statistical theory and inference by STT 203. STT 216 is an intermediate-level course in applied statistics. Computer software packages are integrated into the applied and some of the advanced courses.

REQUIREMENTS FOR STATISTICS MAJORS

- MTH 161 and 162 or their equivalents (141–143).
- 10 additional courses:
  a. Six to eight statistics courses, including STT 212 or 213 (or 211), 201, 203, and 226W.
  b. Two to four courses in an allied field, such as computer science, economics, mathematics, political science, and -psychology.
  c. In addition: CSC 171 or EE 171 or STT 277–278 or equivalent.

DOUBLE MAJORS

The above requirements are also needed for the double majors—statistics and another field such as economics, mathematics, political science, and psychology. Approvals of both the departments are required. Not more than three courses can be duplicated for the two majors.

JOINT CONCENTRATION IN MATHEMATICS AND STATISTICS

MTH 161, 162, 164, 165, and 235 (or 173); MTH or STT 201, 202, 203, and 208; STT 226W; two additional 200-level courses in mathematics and/or statistics; CSC 171 or EE 171 or STT 277–278 or equivalent. Approvals of the advisors in both the programs are required.

REQUIREMENTS FOR A MINOR IN STATISTICS

A total of five courses is required:
1. STT 201.

2. STT 203.
3. STT 211 or 212 (or 213).
4. At least one of the following:
STT 216.
STT 226W.
5. At least one elective from the offerings of the program or computing courses, such as CSC 171 or EE 171 or STT 277–278 approved by the statistics program advisor.

UPPER-LEVEL WRITING REQUIREMENT
Statistics majors: STT 226W and STT 221W; STT 216 with a project may be substituted for one of these courses.

Joint mathematics/statistics majors: an MTH xxxW course may be substituted for one of the above courses.

COURSES OF INSTRUCTION
Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted.
Following are some of the recent or planned offerings.

201. Introduction to Probability. Probability spaces, combinatorial problems, random variables and expectations, discrete and continuous distributions, generating functions, independence and dependence, binomial, normal, and Poisson laws, laws of large numbers. Prerequisite: MTH 143 or 162. Same as MTH 201.
202. Introduction to Stochastic Proc-esses. Theory and applications of random processes, including Markov chains, Poisson processes, birth-and-death processes, random walks. Prerequisite: STT 201. Same as MTH 202.
203. Introduction to Mathematical Statistics. Discrete and continuous probability distributions and their properties. Principle of statistical estimation and inference. Point and interval estimation. Maximum Likelihood method for estimation and inference. Tests of hypotheses and confidence intervals, contingency tables, and related topics. Prerequisites: MTH 161, 162, STT 201 or familiarity with the elementary principles of probability, expected value, variance and covariance. Same as MTH 203.
211. Applied Statistics for the Social Sciences I. Descriptive statistics, statistical analysis, and statistical inference as used in the social sciences; including elements of correlation, regression, and analysis of variance. Excel, Minitab, and similar programs.
212. Applied Statistics for the Biological and Physical Sciences I. Descriptive statistics, statistical analysis, and statistical inference as used in the biological and physical sciences; including elements of correlation, regression, and analysis of variance. Excel, Minitab, and similar programs.
213. Elements of Probability and Statistics. Probability, probability distributions, random variables, moments, principles of statistical inference, estimation, hypothesis testing. Prerequisite: MTH 141 or equivalent.
216. Applied Statistics II. Continuation of 211 or 212. Analysis of variance, regression, correlation contingency table analysis, and associated topics. Prerequisite: STT 211 or 212. Excel, Minitab, and similar programs.
221W. Sampling Techniques. Simple random, stratified, systematic, and cluster sampling; estimation of the means, proportions, variance, and ratios of a finite population. Ratio and regression methods of estimation and the use of auxiliary information. The nonresponse problem. Prerequisites: STT 211, 212, or 213, and familiarity with the concepts of expectation, variance, covariance, and correlation. STT 203 would be helpful.
222. Design of Experiments. Randomized blocks and Latin squares, one- and two-way classifications, factorial experiments, analysis of variance and covariance, t-tests and F-tests. Excel, Minitab, JMP and SAS, and similar programs.
226W. Introduction to Linear Models. Simple linear, multiple, and polynomial regression models and applications; ordinary and generalized least squares, estimation, tests of hypotheses and confidence intervals, and simultaneous inference, and computer packages. Computer programs including JMP and SAS. Prerequisites: STT 165 or 212, and STT 203.
241. Applied Multivariate Analysis. Credit—2 hours. Methodology and applications of multivariate analysis. Hotelling's T-square, multivariate regression, and analysis of variance. Classification and discrimination. Principal components, clustering, and multidimensional scaling. Computer programs including JMP and SAS. Prerequisite: STT 226.
277. Computing: Introduction to Statistical Software. Credit—2 hours. Introduction to the MINITAB, SAS, and R, programming environments. Some general theoretical and practical topics in computing also presented. Individual projects on some advanced topics. Prerequisites: STT 212 and either STT 216 or STT 226W. (Course offered first half of semester.)
278. Methods of Data Analysis. Credit—2 hours. Philosophy and techniques of exploratory data analysis. Each student analyzes a single real-life data set in some depth using SAS or R and discusses his or her work with the class. Prerequisite: STT 277. (Course offered second half of semester.)
390. Supervised College Teaching.
391. Independent Study in Statistics. Supervised reading arranged on an individual basis. Prerequisite: consent of the department.

394. Internship. Arranged by the student and supervised by the advisor.

In addition, some 400-level courses are available to qualified undergraduates through the Department of Biostatistics.

VISUAL SCIENCE

Richard N. Aslin, Ph.D. (Minnesota) *William R. Kenan Professor of Brain and Cognitive Sciences, Professor of Psychology and in the Center for Visual Science; Director, Center for Brain Imaging*

Greg DeAngelis, Ph.D. (California, Berkeley) *Professor of Brain and Cognitive Sciences, of Neurobiology and Anatomy, of Biomedical Engineering, and in the Center for Visual Science*

Charles J. Duffy, Ph.D. (Johns Hopkins) *Professor of Neurology, of Neurobiology and Anatomy, of Ophthalmology, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Steven Feldon, M.D. (Albert Einstein College of Medicine) *Professor of Ophthalmology, of Neurology, and in the Center for Visual Science; Chair of the Department of Ophthalmology*

James Fienup, Ph.D. (Stanford) *Robert E. Hopkins Professor of Optics and Professor in the Center for Visual Science*

Robert A. Jacobs, Ph.D. (Massachusetts, Amherst) *Professor of Brain and Cognitive Sciences, of Psychology, of -Computer Science, and in the Center for Visual -Science*

David Knill, Ph.D. (Brown) *Professor of Brain and Cognitive Sciences and in the Center for Visual Science; Associate Director of the Center for Visual Science*

Peter Lennie, Ph.D. (Cambridge) *Robert L. and Mary L. Sproull Dean of the Faculty of the College of Arts, Sciences, and Engineering; Professor of Brain and Cognitive Sciences and in the Center for Visual Science*

Scott M. MacRae, M.D. (Wisconsin) *Professor of Ophthalmology and in the Center for Visual Science*

William R. Merigan, Ph.D. (Maryland) *Pro-fes-sor of Ophthalmology, of Environmental Medicine, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Gary D. Paige, M.D. (Chicago) *Kilian J. and Caroline F. Schmitt Professor of Neurobiology and Anatomy, Professor of Biomedical Engineering, of Ophthalmology, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Tatiana Pasternak, Ph.D. (Copenhagen) *Pro-fessor of Neurobiology and Anatomy, of Brain and Cognitive Sciences, and in the Center for Visual Science*

Marc H. Schieber, M.D. (Washington) *Professor of Neurology, of Neurobiology and Anatomy, of Physical Medicine and Rehabilitation, of Brain and Cognitive Sciences, and in the Center for Visual Science*

David R. Williams, Ph.D. (California, San Diego) *William G. Allyn Professor of Medical Optics, Professor of Optics, of Brain and Cognitive Sciences, of Ophthalmology, of Biomedical Engineering, and in the Center for Visual Science; Director of the Center for Visual Science*

Daphne Bavelier, Ph.D. (M.I.T.) *Associate Professor of Brain and Cognitive Sciences, of Radiology, and in the Center for Visual Science*

Edward Freedman, Ph.D. (Pennsylvania)
Associate Professor of Neurobiology and Anatomy and in the Center for Visual Science

Lin Gan, Ph.D. (University of Texas)
Associate Professor of Ophthalmology, of Center for Aging and Developmental Biology and in the Center for Visual Science

Krystel Huxlin, Ph.D. (University of Sydney) *Associate Professor of Ophthalmology and in the Center for Visual Science*

Alexandre Pouget, Ph.D. (California, San Diego) *Associate Professor of Brain and Cognitive Sciences, of Biomedical Engineering, and in the Center for Visual -Science*

Alfredo Dubra, Ph.D. (Imperial College)
Assistant Professor of Ophthalmology and in the Center for Visual Science

Holly Hindman, M.D. (Harvard Medical School) *Assistant Professor of Ophthalmology and in the Center for Visual Science*

Richard Libby, Ph.D. (Boston) *Assistant Professor of Ophthalmology and in the Center for Visual Science*

Ania Majewska, Ph.D. (Columbia) *Assistant Professor of Neurobiology and Anatomy and in the Center for Visual Science*

Raphael Pinaud, Ph.D. (Oregon Health & Science) *Assistant Professor of Brain and Cognitive Sciences and in the Center for Visual Science*

Lizabeth Romanski, Ph.D. (Cornell) *Assistant Professor of Neurobiology and Anatomy and in the Center for Visual Science*
Duje Tadin, Ph.D. (Vanderbilt) *Assistant Professor of Brain and Cognitive Sciences and in the Center for Visual Science*
Geunyoung Yoon, Ph.D. (Osaka University)
Assistant Professor of Ophthalmology, of Biomedical Engineering, and in the Center for Visual Science

Teaching assistants occasionally assist instructors in the courses offered in the Center, primarily in large courses or those requiring laboratories or numerous demonstrations.

The Center for Visual Science (CVS) fosters research on how the eye and brain allow us to see. CVS brings together a large number of faculty with ties to the departments of brain and cognitive sciences, ophthalmology, optics, neurobiology and anatomy, and neurology. Our interdisciplinary group provides an un-usual opportunity for students to experience the frontiers of research on the visual system and brain function. To make these opportunities more accessible to undergraduates, we offer both a minor and a research minor in visual science. The minor emphasizes course-work while the research minor emphasizes hands-on experience in a modern vision labo-ratory. Either of these minors may be of interest to undergraduates who choose to concentrate in any of a number of other disciplines. The most natural and valuable combinations might link a visual science minor with a concentration in computer science, neuroscience, optics, or brain and cognitive sciences although other combinations are possible.

REQUIREMENTS FOR A MINOR IN VISUAL SCIENCE

Five courses are required.

1. One of the following:
- CVS 110/BCS 110. Neural Foundations of Behavior
- CVS 111/BCS 111. Foundations of Cognitive Science
- CVS 153/BCS 153. Cognition
- BCS 240/NSC 201. Basic Neurobiology

2. CVS 151/BCS 151. Perception and Action

3. One of the following:
- CVS 208/BCS 208. Laboratory in Perception and Cognition
- OPT 448/BCS 526. Principles of Eye Design (with permission of instructor)

4. One of the following upper-level courses:
- CVS 220/BCS 220. The Intelligent Eye
- CVS 228/BCS 228. The Human-Machine Interface
- CVS 245/BCS 245. Sensory and Motor Neuroscience
- CVS 504/BCS 504. Sensory Systems (with permission of instructor)
- CVS 505/BCS 505. Perception and Motor Systems (with permission of instructor)

5. CVS 391 or CVS 395. Independent Study/Independent Research in Visual Science

REQUIREMENTS FOR A RESEARCH MINOR IN VISUAL SCIENCE

Five courses are required.

1. One of the following:
- CVS 110/BCS 110. Neural Foundations of Behavior
- CVS 111/BCS 111. Foundations of Cognitive Science

2. CVS 151/BCS 151. Perception and Action

3. One of the following:
- CVS 208/BCS 208. Laboratory in Perception and Cognition
- OPT 448/BCS 526. Principles of Eye Design (with permission of instructor)

4. *Two* semesters of CVS 395. Independent Research in Visual Science. These may be either with the same faculty member in CVS or with two different faculty.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

110. Neural Foundations of Behavior. Introduces the structure and organization of the brain, and its role in perception, movement, thinking, and other behavior. Topics include the brain as a special kind of computer, localization of function, effects of brain damage and disorders, differences between human and animal brains, sex differences, perception and control of movement, sleep, regulation of body states and emotions, and development and aging. No prerequisites. Same as BCS 110. (Fall)

151. Perception and Action. Explores how the biology of our senses shapes perceptual experiences of reality. Emphasizes sense

of sight primarily and hearing secondarily. An important theme is that our sensory systems play a crucial role in the execution of coordinated movements of our bodies, as we navigate in, and interact with, the environment. Prerequisite: BCS/CVS 110 *or* BCS/CVS 111, or equivalent background. Same as BCS 151. (Fall)

208. Laboratory in Perception and Cognition. Introduces observational studies of perceptual and cognitive phenomena, showing how scientific questions can be answered by making such observations. Students perform, analyze, interpret, and report results from seven experiments conducted in a sequence that gradually increases the independence of the student experimenters. Prerequisites: BCS 200 *and* either CVS 151 or 153. (Spring)

220. The Intelligent Eye. Provides an interdisciplinary view of modern research into how the human brain solves the problems involved in perception, including how we perceive the three-dimensional structure of the world, how we recognize objects, and how visual information is used to control action in the world. Students read contemporary research and, through classroom discussion and critical essays, explore and analyze the questions and debates that define contemporary perceptual science. Prerequisite: CVS 151. Same as BCS 220. (Spring)

245. Sensory and Motor Neuroscience. Provides an overview of the neural basis of perception and action, covering vision, audition, somatosensation, chemical senses, eye movements, and reaching. Topics include a review of sensory transduction, how the brain extracts information from sensory signals, how muscles convert nerve impulses into mechanical forces, how different movements are encoded in the brain, and how an animal's internal state (e.g., memory or attention) influences the course of action. Prerequisite: BCS 240 (NSC 201) or equivalent background with instructor's permission. (Spring)

391. Independent Study. A special program of reading in advanced aspects of visual science. Designed by individual arrangement with a faculty member in the Center for Visual Science. (Fall and Spring)

395. Independent Research. A research course designed by individual arrangement with a faculty member. Complete descriptions of Faculty Research Programs can be found on the Web (www.cvs.rochester.edu) or obtained from the department's Undergraduate Programs Office (102 Meliora). (Fall and Spring)

448. Principles of Eye Design. The course explores the design of the human eye, revealing the optical and neural factors that limit color and spatial vision. The design of eyes (such as those of predatory birds and the compound eyes of insects) that evolved to operate in environments different from that of the human eye also are examined. The course begins with a treatment of the information losses associated with the eye's optics, the photoreceptor mosaic, and the ganglion cell array that transmits visual information to the brain. The course ends with a discussion of image processing by the visual cortex of the brain. (Spring)

WOMEN'S STUDIES

Women's studies offers an interdisciplinary concentration leading to a bachelor's degree, supervised by the program's Curriculum Committee. A minor in women's studies is also available.

STEERING COMMITTEE

Honey Meconi, Ph.D. (Harvard) *Professor of Music and Professor of Musicology in the Eastman School of Music; Director, Susan B. Anthony Institute for Gender and Women's Studies*

Jeffrey Runner, Ph.D. (Massachusetts) *Associate Professor of Linguistics and of Brain and Cognitive Sciences*

Joan Saab, Ph.D. (N.Y.U.) *Associate Professor of Art History and of Visual and Cultural Studies; Director, Visual and Cultural Studies Program*

Ayala Emmett, Ph.D. (Rochester) *Associate Professor of Anthropology*

Larry Hudson, Ph.D. (Keele) *Associate Professor of History*

Jean Pedersen, Ph.D. (Chicago) *Associate Professor of Humanities in the Eastman School of Music and of History*

Stephanie Li, Ph.D. (Cornell) *Assistant Professor of English*

Women's studies focuses on the experiences of diverse groups of women and the changing cultural, economic, political, and psychological relations among women and men. Because women's studies asks questions about women and about gender that no single academic department is able to answer, the program encourages an interdisciplinary approach to research and learning.

The program offers an undergraduate major and minor, an honors program, clusters in the humanities and social sciences, and internships in the Rochester community. Students have the opportunity to work with faculty from the humanities, sciences, and social sciences, who are appointed in the College (arts and sciences), the Eastman School of Music, the Margaret Warner Graduate School of Education and Human Development, the School of Nursing, and the School of Medicine and Dentistry.

In the early 1980s the University opened the program in women's studies to address issues important for understanding the role of women. The Susan B. Anthony Institute for Gender and Women's Studies is named to honor Susan B. Anthony, the nineteenth-century suffragist who led a successful campaign to have women admitted to the University of Rochester in 1900. The Institute draws on Anthony's goals and ideals and preserves her rich historical connection with the city of Rochester.

In addition to the undergraduate curricular program, other programs include undergraduate student conference, undergraduate student workshop with visiting scholars, graduate certificates, graduate fellowships, faculty research seminars, public lecture series, and conferences.

REQUIREMENTS FOR CONCENTRATION IN WOMEN'S STUDIES

The interdepartmental major in women's studies requires 12 courses:

- WST 200W (Colloquium)
- Three courses (12 credits) from among the Foundation courses
- Six electives in women's studies (24 credits) from courses listed with at least two departments
- WST 394, Internship, or WST 395, Independent Research (4 credits)
- WST 396, Research Seminar (4 credits)

HONORS IN RESEARCH

Majors who are carrying a women's studies GPA of 3.3 or better and who have successfully completed at least one 300-level course (4 credits) in women's studies by the end of their junior year are eligible to work for honors in women's studies in their senior year. In the senior year, the honors sequence combines independent research (WST 393H) or an internship (WST 394H) in the fall with the production of an honors thesis (WST 397H) in the spring.

REQUIREMENTS FOR A MINOR IN WOMEN'S STUDIES

Five courses in Women's Studies:

- WST 200
- Two courses (8 credits) from among the remaining Foundation courses
- Two electives in women's studies (8 credits) from courses listed with at least two departments (no more than two courses included in the student's major may be counted toward the minor)

CLUSTERS

Social Sciences

Gender and History
Gender and Public Policy
Gender and Social Issues
Gender, Science, and Health
History and Theory of Feminism

Humanities

Gender and Literature
Gender, Culture, and Representation
Gender and Sexuality
Race and Gender

UPPER-LEVEL WRITING REQUIREMENT

We require that all women's studies majors successfully complete two upper-level writing courses:

1. WST 200W, Women's Studies Colloquium
2. ONE of the following courses:
  a. WST 391, Independent Study, provided that it requires substantial research, writing, and revision
  b. WST 396, Women's Studies Seminar, as a writing course, by arrangement with the instructor

c. Majors who are minoring in another program or department may take an upper-level writing course in their minor

Note for double-majors: the College requires that the upper-level writing requirement be satisfied separately for EACH major.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

FOUNDATION COURSES

WOMEN AND GENDER IN HISTORY
WST 201/HIS 250. Women in History: United States 1600–1970.
WST 261/HIS 259. African-American Women's History.
WST 251/HIS 296. Women in East Asia.
WST 296/HIS 314. International Human Rights.

WOMEN AND GENDER IN SOCIETY
WST 202/ANT 103. Women in Society.
WST 218/ANT 244. Marriage, Families, and Communities in a Global Perspective.

WOMEN AND GENDER IN POLITICS
WST 203F. Women in Politics.

WOMEN AND GENDER IN ART
WST 214/AH 210. Woman as Text and Image.
WST 225/AH 259. Woman, Cloth, and Culture.

PHILOSOPHICAL FOUNDATIONS OF FEMINISM
WST 205F/PHL 171. Philosophical Foundations of Feminism.

FEMINISM, GENDER, AND HEALTH
WST 206F/HLS 206. Feminism, Gender, and Health.

WOMEN WRITERS
WST 240/ENG 126. Writing Women's Lives.
WST 256/SP 260. Latin American Women Writers
WST 273/JPN 273. Japanese Women Writers.
WST 339/ENG 230. Contemporary Black Women Writers.
WST 243/ENG 243. Jane Austen.
WST 243/ENG 243. The Brontes.
WST 243/ENG 243. Toni Morrison.

FEMINISM AND GENDER STUDIES IN FILM
WST 204/FR 287. Feminist Film Theory.
WST 288/CLT 212. Mothers, Comrades, and Whores.
WST 264/CLT 216. Women in Hispanic Film.
WST 262/CLT214. Women in Japanese Film.

GENDER AND SEXUALITY
WST 103/LIN 103. Language and Sexuality.
WST 272/GER 272. Sexuality and Gender.
WST 209D/AH 205. Representing Differences.

ELECTIVES

A variety of additional elective courses are offered every semester. Please see Web page for up-to-date information

(www.rochester.edu/college/wst).

391. Independent Study. (Reading course in gender and women's studies.)

393. Independent Research. Students design their own research project based on an area of scholarly exploration within gender and women's studies. The student is expected to use the material from previous coursework.

393H. Independent Research—Honors.

394. Internship in Women's Studies. Students receive experience and course credit by working with local Rochester organizations in the arts, education, health, law, media, politics, and social services. These internships focus on gender and women's studies.

394H. Internship—Honors.

396. Seminar in Women's Studies.

Examines from a multidisciplinary perspective a particular topic related to gender and women's studies. Provides in-depth research opportunities.

397. Independent Honors Thesis.

Further information is available from the Susan B. Anthony Institute for Gender and Women's Studies, 538 Lattimore Hall, University of Rochester, P.O. Box 270434, Rochester, New York 14627-0434. Phone: (585) 275-8318. Fax: (585) 461-9376. Web: www.rochester.edu/college/wst.

Edmund A. Hajim School of

Engineering & Applied Sciences

ADMINISTRATIVE OFFICERS

Peter Lennie. M.D. (Rochester) *Robert L. and Mary L. Sproull Dean of the Faculty of Arts, Sciences and Engineering*

Richard Feldman, Ph.D. (Massachusetts) *Dean of the College*

Robert L. Clark Ph.D. (Virginia Polytechnic Institute and State University) *Dean of the Edmund A. Hajim School of Engineering and Applied Sciences*

Thomas Y. Hsiang, Ph.D. (University of California, Berkley) *Associate Dean of the Edmund A Hajim School of Engineering and Applied Sciences*

The College encompasses the disciplines of the School of Arts and Sciences, as well as the departments within the Edmund A. Hajim School of Engineering and Applied Sciences, that together enroll the majority of University undergraduates and graduate students.

The Hajim School of Engineering and Applied Sciences offers degree programs leading to the Bachelor of Arts, Bachelor of Science, Master of Science, and Doctor of Philosophy degrees. Based on the fundamentals of science and engineering, the programs exist in and benefit from a strong liberal arts environment.

The undergraduate program provides education for a lifetime career, not simply training for a specific job. The programs have two major objectives:

1. To prepare students for positions as practicing engineers, scientists, and leaders in industry, government, education, and other areas of society.

2. To prepare students for graduate work leading to professions in medicine, law, and business as well as engineering and science, giving them an understanding of science and technology that will provide a firm foundation for their lifework.

Each program has adopted more specific goals and objectives that are given in the appropriate discipline sections of this bulletin.

The emphasis is on both individual opportunity and collaborative team effort. Students are encouraged to participate in the many active research projects both in the School, and through cooperative internships in business and industry. Flexibility in each program makes it possible to incorporate specialized coursework. For instance, engineering students can pursue elective work and undertake research projects in such fields as architecture, environmental studies, and materials science.

In their first year, enrolled students who have expressed an interest in an engineering concentration are assigned engineering faculty advisors who counsel interested students on the School's degree requirements, policies, and procedures. Students formally enter the School at the end of their sophomore year or at any time in their undergraduate tenure that they have satisfied the necessary prerequisites.

Four-year courses of study lead to the Bache-lor of Arts degree in computer science and engineering science, the Bachelor of Science degree in biomedical engineering, computer science, chemical engineering, electrical and computer engineering, geome-chanics, mechanical engineering, optics, or an interdepartmental program in engineering and applied science. The Bache-lor of Science degree programs in chemical, biomedical, electrical and computer, and mechanical engineering are accredited by the Accreditation Board for Engineering and Technology; seniors in these programs are eligible to take the "Fundamentals of Engineering Examination'' and are encouraged to do so. This is the first of two examinations leading to professional licensure. See pages 136–159 for details about these programs.

BACHELOR OF ARTS
IN ENGINEERING SCIENCE

One option for students, especially those who are uncertain about their intended specialization or are interested in a broad introduction to several fields of engineering, is the B.A. in engineering science. This program provides a strong, technological education for students considering careers in law, medicine, or business, or wishing to delay engineering specialization to the graduate level. The underlying science and mathematics requirements are similar to those needed for most science and engineering concentrations. The other requirements are the same as those prescribed for liberal arts degrees. As a result, the decision on a wide variety of possible course selections can be made at the beginning of the junior year, later than the usual timing for prospective engineering B.S. students. (See page 159 for more details.)

REQUIREMENTS FOR THE
DEGREE BACHELOR OF SCIENCE

In addition to the specific courses stipulated in the degree programs, students must satisfactorily complete the following:

1. Semester hour requirements: The Department of Biomedical Engineering requires a minimum of 130 semester hours; the Department of Chemical Engineering, 130; the Department of Computer Science, 128; the Department of Electrical and Computer Engineering, 128; the Department of
Mechanical Engineering, 130; and The
Institute of Optics, 130.

2. Writing: Entering students are advised by the College Writing Center in the selection of an appropriate primary writing course. Students should complete this requirement by the end of their first year. The ability to communicate clearly and effectively is extremely important. Each department and program has incorporated a discipline-specific upper-level writing experience into the curriculum, as described in the bulletin sections of each program. Every student must complete the upper-level writing requirements of their degree program.

3. Cluster requirements: Clusters in the areas of humanities and social sciences are an important and integral part of an engineering education, and should be carefully chosen with the help of faculty advisors. Students in Bachelor of Science degree programs in biomedical, chemical, electrical and computer, or mechanical engineering are required to complete one cluster in either the humanities or social sciences and an additional one or two humanities or social science courses for distribution requirements. Students completing the Bachelor of Science degree programs in computer science, geomechanics, optics, or the interdepart-mental program, or the Bachelor of Arts in computer science or engineering science, are required to complete two clusters, one each in the humanities and social sciences.

Another way of fulfilling cluster and distribution requirements is to choose a minor from the offerings within the humanities or social science areas (which still requires a total of five or six courses from these areas). Refer to individual department or program sections in this bulletin for further details.

4. Distribution requirements: Engineering students must take four to six humanities and/or social sciences courses depending on their department's policy. For ABET- accredited degree programs, three of these courses must constitute an approved humanities/social sciences cluster (regardless of the classification of the individual courses that make up the cluster). The remaining one or two courses must be classified by the College as humanities and/or social sciences courses.

5. Residency requirement: The intent of the residency requirement is to ensure that graduates have taken a substantial number of the advanced courses required for their concentration in a timely fashion at the University of Rochester. To qualify for an undergraduate degree, a student must complete at least four semesters of full-time study, or, for part-time students, the equivalent number of credit hours.

6. Cumulative grade-point average: an average of at least 2.0 for all courses taken for credit at the University of Rochester, and an average of at least 2.0 in courses specified by the department or program of concentration.

7. All students accepted into the Hajim School of Engineering and Applied Sciences become responsible for two full years of equipment fees. These are normally assessed during each semester of the junior and senior years.

FLEXIBLE FIRST YEAR

Students intending to pursue an engineering program are accepted into the College in their first year and are assigned an advisor

from the engineering faculty. Students choose their engineering and sciences electives in consultation with their faculty advisor. First-year students who have chosen a major field should take the courses recommended for that concentration as indicated under specific departmental listings. Other students may use the engineering electives to explore options within the engineering fields. It is not necessary to select a major field until the end of the first year because appropriate engineering courses taken in the first year can be used as electives in each program—all required
courses can be taken in the last three years.

Students may transfer into the Hajim School of Engineering and Applied Sciences at the University of Rochester at any time, but will find it necessary to satisfy those prerequisites they may be lacking.

MINORS

The Hajim School of Engineering and Applied Sciences recognizes all minors offered by the College. In addition, the Hajim School of Engineering and Applied Sciences offers minors in bioenvironmental engineering, biomedical engineering, chemical engineering, computer science, electrical and computer engineering, environmental engineering, materials science, mechanical engineering, and optics. These minors are available to all undergraduates as a way to strengthen their academic program.

ORT BRAUDE COLLEGE EXCHANGE PROGRAM

The College is pleased to offer a unique and innovative English-language study abroad program at the ORT Braude College in Karmiel, Israel, designed especially for
University of Rochester students of science and engineering. The program specifically meets the needs of sophomores considering majoring in mechanical, chemical, electrical and computer, and biomedical engineering, and chemistry, physics, and computer science. Some juniors (for example, Take Five
students) may be eligible.

While on the program, students live in the ORT Braude residence halls. An inexpensive cafeteria, sports facilities, extracurricular activities, and many social functions are available on campus. Each Rochester student has a local student mentor. Students have the opportunity to learn Hebrew on the program, and to take Introduction to the History and Archaeology of the Galilee as well. Students may also choose to stay in Israel for the summer on the 8-credit summer archaeological dig in the Galilee, a University of Rochester summer study abroad program.

This is a spring-only program. Approximate dates are March 1 through July 5, with a one-week break during the Israeli Passover vacation. All courses are taught in English. The application deadline is October 15. Additional information is available at the Center for Study Abroad and Interdepartmental Programs, 206 Lattimore Hall, and on the Web at www.hajim.rochester.edu/options/ORT-Braude.html.

INDUSTRY PRACTICUM

When looking for employment, students have discovered that employers increasingly demand significant practical work experience in addition to sound academic knowledge. The optional Industry Practicum provides an opportunity for students to enhance their education by integrating their engineering and computer science knowledge with workplace practice. Students intending to pursue an engineering or computer science degree are encouraged to participate in the School's Industry Practicum, a paid, full-time, high quality work experience over an eight-month period.

To participate, a student must be a second-
semester junior or a first-semester senior and be pursuing a degree in any engineering discipline, optics, or computer science. During the eight-month Industry Practicum, students do not take any classes, receive any academic credit, or pay tuition. As a result, it is important for students to meet with their faculty advisors to plan their potential participation in the Industry Practicum to ensure that they meet departmental requirements. Advisors assist students in curriculum planning since four-and-a-half-year's time will be necessary to complete the usual four-year academic program.

Additional information on this program can be obtained from the School's Deans Office, 306 Lattimore Hall, or from the Career Center, Meliora Hall.

TAKE FIVE SCHOLARS PROGRAM

Students may extend undergraduate work beyond the normal four-year period to include additional courses related to their interests by applying to the Take Five Scholars Program. If accepted, students may elect an additional semester or an extra year without tuition charges. Students wishing to apply for the Take Five Scholars Program should consult their faculty advisors.

KAUFFMAN ENTREPRENUERIAL YEAR (KEY) PROGRAM

The KEY program also provides an opportunity for students to spend a fifth year at the University. Students who participate in this program study or practice entreprenuership through internships, special projects, business plan development, and research into vari-

ous facets of entrepreneurship or analysis of how culture and public policy influence entrepreneurial activity.

DOUBLE DEGREES

Students may earn both a degree in the Hajim School of Engineering and Applied Sciences and a B.A. or B.S. degree in a chosen liberal arts or science concentration. These students essentially complete a program similar to a two-college program, but do so entirely at the University of Rochester. Dual degrees require significant work beyond the normal requirements of a four-year program, and all degree requirements for both programs must be satisfied. Any extension past the normal four-year time span will not be tuition free.

Students may earn two bachelor degrees from the Hajim School of Engineering and Applied Sciences; however, the interdepartmental B.S. program may not be one of the two degrees unless approved by the Administrative Committee.

B.S.-M.S. PROGRAMS

Combined B.S.-M.S. programs in biomedical engineering, chemical engineering, computer science, electrical engineering, materials science, mechanical engineering, and optics are available to those students wanting to blend their undergraduate program with graduate study.

Students who wish to complete a bachelor's degree in engineering and a Master of Business Administration may be able to combine an undergraduate engineering program with work in the William E. Simon Graduate School of Business Administration. Because engineering program requirements exceed those of other undergraduate majors, the majority of engineering undergraduates will not be ready to take advantage of the application schedule followed by most University undergraduates from other disciplines. Therefore, the Simon School offers two additional options to accelerate the completion of both undergraduate and graduate degrees to eligible engineering students. (Engineering science majors are encouraged to arrange their programs to participate in the normal 3-2 program.)

Option 1 requires students to apply by November 15 of their senior year for admission to the M.B.A. program beginning in January. This option offers the student the full benefits of M.B.A. study insofar as the core courses are taken in sequence and the study-team approach is fully realized. Option 1 also offers the opportunity for students to take a summer internship, provided the student is willing to add the three courses normally taken during the summer quarter (one each) to the remaining three academic quarters of the second year of M.B.A. coursework.

Option 2 is designed for engineering students who will not complete required engineering courses by the end of the fall semester of their senior year. Students commence M.B.A. coursework on a part-time basis during the fall semester of their senior year. Although option 2 permits the completion of both the bachelor's and master's degrees in five years, it usually does not involve a summer internship nor does it offer the strong team experience and class bonding opportunities of option 1.

Both of these options may require that students take an overload, summer courses, or prerequisite coursework during the junior or senior year; students should also be aware that the Simon School operates on a quarter system calendar. Students must have solid academic records and must score well on the Graduate Management Admissions Test (GMAT), which should be taken by January of their junior year, to be considered for admission. (See page 165 for details about this program.)

TRANSFER PROGRAMS

Students with engineering interests may transfer into the Hajim School of Engineering and Applied Sciences from other institutions. If they have had the equivalent of the first two years of science, mathematics, and pre-engineering, such students may enter the School directly and complete their degree requirements in an additional two years. This common pattern is often described as a "2+2" program. Another pattern is for students with a science and mathematics background in a liberal arts college to transfer after three years and then concentrate on engineering courses in order to complete an engineering degree in two more years. Often, on completion of the five years the first institution will confer a B.A. degree at the same time a B.S. in engineering is awarded at Rochester. Transfer programs formalized in this way are "3-2" programs. There are established agreements on 2+2 and 3-2 programs with a few regional institutions. However, a number of students with these transfer characteristics are admitted to the School on an individual basis. Course equivalency and credit are determined for each case. See page 187 of this bulletin for more on transfer possibilities.

ACADEMIC INFORMATION AND ADVISING

The Dean's Office in Lattimore Hall assists students with course changes, summer school approval, preparation for graduate and professional study, independent study and special courses, and academic petitions. For specific regulations on these and other aspects of program planning, turn to the Academic Services and Information section of this bulletin (pages 172–177).

The Hajim School of Engineering and Applied Sciences assigns faculty advisors to each known prospective engineering student in

the first year to provide information about different engineering fields and to help students plan and review course schedules and degree programs. The Dean's Office coordinates the advising process, and every attempt is made to match advisors with individual interests and needs.

All courses in the School are taught by full-time faculty members with professorial rank or by part-time faculty members with the rank of professor or lecturer. In courses that have more than 25 students, student teaching assistants may aid the professor in supervising laboratory sessions, running regularly scheduled problem sessions, or grading homework.

BIOMEDICAL ENGINEERING

For any questions or changes to the BME curriculum, please contact the BME undergraduate coordinator at (585) 273-4754 or visit our Web site at www.bme.rochester.edu.

BIOMEDICAL ENGINEERING FACULTY

Laurel H. Carney, Ph.D. (Wisconsin) *Professor of Biomedical Engineering and of Neurobiology and Anatomy*

Richard E. Waugh, Ph.D. (Duke) *Professor of Biomedical Engineering, of Pharmacology and Physiology, of Biochemistry and Biophysics, and of Mechanical Engineering; Chair of the Department*

Diane Dalecki, Ph.D. (Rochester) *Associate Professor of Biomedical Engineering and of Electrical and Computer Engineering; Director, Rochester Center for Biomedical Ultrasound*

Amy L. Lerner, Ph.D. (Michigan) *Associate Professor of Biomedical Engineering, of Mechanical Engineering, and in the Center for Musculoskeletal Research*

Anne E. Luebke, Ph.D. (Johns Hopkins) *Associate Professor of Biomedical Engineering and of Neurobiology and Anatomy*

James McGrath, Ph.D. (M.I.T.) *Associate Professor of Biomedical Engineering*

Axel Wismüller, M.D. (Technical University of Munich, Germany) *Associate Professor of Biomedical Engineering and of Imaging Sciences*

Hani Awad, Ph.D. (University of Cincinnati) *Assistant Professor of Biomedical Engineering and of Orthopaedics*

Danielle Benoit, Ph.D. (Colorado) *Assistant Professor of Biomedical Engineering and in the Musculoskeletal Research Center*

Edward Brown III, Ph.D. (Cornell) *Assistant Professor of Biomedical Engineering*

Kevin Davis, Ph.D. (Boston) *Assistant Professor of Biomedical Engineering and of Neurobiology and Anatomy*

Gregory Gdowski, Ph.D. (Boston) *Assistant Professor of Biomedical Engineering and of Neurobiology and Anatomy*

Mathews Jacob, Ph.D. (Swiss Federal Institute of Technology, Switzerland) *Assistant Professor of Biomedical Engineering, of Electrical and Computer Engineering, and of Imaging Sciences*

Nicholas N. Kuzma, Ph.D. (Yale) *Assistant Professor of Biomedical Engineering and of Imaging Sciences*

Stephen McAleavey, Ph.D. (Rochester) *Assistant Professor of Biomedical Engineering and of Electrical and Computer Engineering*

David Pinto, Ph.D. (Pittsburgh) *Assistant Professor of Biomedical Engineering and Neurobiology and Anatomy*

Scott Seidman, Ph.D. (Case Western Reserve)*Assistant Professor of Biomedical Engineering, of Neurobiology and Anatomy, and in the Center for Visual Science*

JOINT APPOINTMENTS WITH BIOMEDICAL ENGINEERING

Gregory DeAngelis, Ph.D. (California, Berkeley) *Professor of Brain and Cognitive Sciences, of Biomedical Engineering, of Neurobiology and Anatomy, and in the Center for Visual Science*

David Dean, Ph.D. (California, Berkeley) *Professor of Pediatrics and of Biomedical Engineering*

Virkrim Dogra, M.B.B.S. (University of Madras, India) *Professor of Imaging Sciences and of Biomedical Engineering*

Philippe M. Fauchet, Ph.D. (Stanford) *Distinguished Professor of Electrical and Computer Engineering, Professor of Materials Science, of Optics, of Biomedical Engineering, and of Physics, and Senior Scientist in the Laboratory for Laser Energetics*

Bruce M. Fenton, Ph.D. (California, San Diego) *Professor of Radiation Oncology and of Biomedical Engineering*

Robert D. Frisina, Ph.D. (Syracuse) *Professor of Otolaryngology, of Biomedical Engineering, and of Neurobiology and Anatomy*

Sheryl Gracewski, Ph.D. (California, Berkeley) *Professor of Mechanical Engineering and of Biomedical Engineering*

Duncan T. Moore, Ph.D. (Rochester) *Prof-essor of Optics and of Biomedical Engineering and Rudolph and Hilda Kingslake Professor of Optical Engineering Science*

Maiken Nedergaard, M.D. (University of Copenhagen) *Professor of Neurosurgery and of Biomedical Engineering*

Ruola Ning, Ph.D. (Utah) *Professor of Imaging Sciences, of Oncology, of Radiation Oncology, of Electrical and Comuter Engineering, and of Biomedical Engineering*

Lukas Novotny, Ph.D. (Swiss Federal Institute of Technology) *Professor of Optics, of Physics, and of Biomedical Engineering and Scientist in the Laboratory for Laser Energetics*

Gary Paige, M.D. (Chicago) *Kilian J. and Caroline F. Schmitt Professor of Neurobiology and Anatomy, of Neurology, of Ophthalmology, of Brain and Cognitive Sciences, in the Center for Visual Science, and of Biomedical Engineering; Chair of Neurobiology and Anatomy*

Kevin J. Parker, Ph.D. (M.I.T.) *William F. May Professor of Engineering, Professor of Electrical and Computer Engineering, of Imaging Sciences, and of Biomedical Engineering*

Renato Perucchio, D. Engr. (Pisa, Italy) *Professor of Mechanical Engineering and of Biomedical Engineering and Associate Professor of Pediatrics*

J. Edward Puzas, Ph.D. (Rochester) *Donald and Mary Clark Professor of Orthopaedics and Professor of Biomedical Engineering*

Jannick Rolland, Ph.D. (University of Arizona)*Brian J. Thompson Professor of Optical Engineering, Professor of Optics and of Biomedical Engineering*

Ingrid H. Sarelius, Ph.D. (Auckland, New Zealand) *Professor of Pharmacology and Physiology and of Biomedical Engineering*

Michael C. Schell, Ph.D. (Wisconsin, Madison) *Professor of Radiation Oncology and of Biomedical Engineering*

Denham S. Ward, M.D. (Miami) *Professor of Anesthesiology and of Biomedical Engineering*

David R. Williams, Ph.D. (California, San Diego) *William G. Allyn Professor of Medical Optics, Professor of Optics, of Brain and Cognitive Sciences, of Psychology, of Ophthalmology, of Biomedical Engineering, and in the Center for Visual Science; Director of the Center for Visual Science*

J. H. David Wu, Ph.D. (M.I.T.) *Professor of Chemical Engineering, of Microbiology and Immunology, and of Biomedical Engineering*

Jianhui Zhong, Ph.D. (Brown) *Professor of Imaging Sciences, of Biomedical Engineering, and of Physics*

Andrew Berger, Ph.D. (M.I.T.) *Associate Professor of Optics and of Biomedical Engineering*

David Borkholder, Ph.D. (Stanford) *Adjunct Associate Professor of Biomedical Engineering; Assistant Professor, Electrical Engineering, Rochester Institute of Technology*

Patricia Chess, M.D. (Columbia) *Associate Professor of Pediatrics and of Biomedical Engineering*

Edward G. Freedman, Ph.D. (Pennsylvania*) Associate Professor of Neurobiology and Anatomy, of Biomedical Engineering, and in the Center for Visual Science*

Denise Hocking, Ph.D. (Albany) *Associate Professor of Pharmacology and Physiology and of Biomedical Engineering*

Ben Miller, Ph.D. (Stafford) *Associate Professor of Dermatology, of Biochemistry and Biophysics, and of Biomedical Engineering*

Jack G. Mottley, Ph.D. (Washington, St. Louis) *Associate Professor of Electrical and Computer Engineering and of Biomedical Engineering*

Wael Saad, M.D. (Ain Shams University, Egypt) *Associate Professor of Imaging Sciences and of Biomedical Engineering*

Edward M. Schwarz, Ph.D. (Albert Einstein College of Medicine) *Associate Professor of Orthopaedics, of Microbiology and Immunology, of Urology, of Medicine, of Pathology and Laboratory Medicine, and of Biomedical Engineering*

Wojciech Zareba, M.D. (Medical University of Lodz, Poland) *Associate Professor of Medicine and of Biomedical Engineering*

James M. Zavislan, Ph.D. (Rochester) *Associate Professor of Optics, of Dermatology, of Ophtalmology, and of Biomedical Engineering*

Lisa A. DeLouise, Ph.D. (Pennsylvania State) *Assistant Professor of Dermatology and of Biomedical Engineering*

Jeffery Houck, Ph.D. (University of Iowa) *Adjunct Assistant Professor of Biomedical Engineering*

Walter O'Dell, Ph.D. (Johns Hopkins) *Assistant Professor of Radiation Oncology and of Biomedical Engineering*

Geunyoung Yoon, Ph.D. (Osaka) *Assistant Professor of Ophthamology, of Biomedical Engineering, and in the Center for Visual Science*

Alfred Clark, Jr., Ph.D. (M.I.T.) *Professor Emeritus of Mechanical Engineering, of Mathematics, and of Biomedical Engineering*

AFFILIATED FACULTY

Arthur Moss, M.D. (Harvard) *Professor of Medicine*

Alice Pentland, M.D. (Michigan) *James H. Sterner Professor of Dermatology; Medical Director of Center for Future Health and Chair of Dermatology*

Deborah Rubens, M.D. (Rochester) *Professor of Imaging Sciences; Associate Chair of Imaging Sciences*

Shey-Shing Sheu, Ph.D. (Chicago) *Professor of Pharmocology and Physiology, of Medicine, and of Anesthesiology*

Peter G. Shrager, Ph.D. (California, Berkeley) *Professor of Neurobiology and Anatomy*

Paul E. Bigeleisen, M.D. (California, Davis) *Associate Professor of Anesthesiology*
Karl Schwarz, M.D. (Rochester) *Associate Professor of Medicine and of Biomedical Engineering*
Xucai Chen, Ph.D. (Yale) *Assistant Professor of Medicine, of Electrical and Computer Engineering, and of Biomedical Engineering*
Jean-Philippe Couderc, Ph.D. (National Institute of Applied Science, Lyon, France)
Research Assistant Professor of Medicine
Edwin Carstensen, Ph.D. (University of Pennsylvania) *Arthur Gould Yates Professor Emeritus of Engineering and Senior Scientist in Electrical and Computer -Engineering*

Biomedical engineering (BME) involves the application of engineering science and technology to solve problems in biology and medicine. This broad area contains many career opportunities, ranging in scope from advanced research to engineering practice in a clinical setting. The Department of Biomedical Engineering, in conjunction with strong academic programs in the basic sciences and other engineering disciplines at the University of Rochester, offers outstanding training in this rapidly growing field.

B.S. IN BIOMEDICAL ENGINEERING

The Bachelor of Science degree program in biomedical engineering at the University of Rochester is one of 60 programs (as of October 2008) that is accredited by the Accreditation Board for Engineering and Technology (ABET). Our curriculum emphasizes fundamental engineering and design principles taught in the context of current problems in medicine and biology. A series of eight core courses required of all BME students provides a solid foundation in engineering principles relevant to biomedical engineering practice. To ensure in-depth training in engineering, students are required to complete a sequence of four engineering courses in a focus area of biomedical engineering. These areas of concentration are Biomechanics, Biosignals and Biosystems, Cell and Tissue Engineering, and Medical Optics. The program is capped with a biomedical engineering senior design course required for all students. This program requires a total of 32.5 courses (130 credit hours), including a minimum of 51 credit hours devoted to mathematics and natural sciences and a minimum of 51 credit hours devoted to engineering.

The faculty of the Department of Biomedical Engineering recognize achievement among our graduates by noting those who graduate with distinction based upon their average grades in their core BME courses. In particular, students who have a GPA of 3.75 or higher in the core BME courses will receive their degrees with Highest Distinction; those with GPAs between 3.50 and 3.74 will be noted to have achieved High Distinction; and those who have GPAs between 3.25 and 3.49 will receive Distinction.

Alternative recognition for meaningful biomedical engineering–related coursework and research is available through the minor in BME. The minor is available to students in any major.

Information about the minor or the major in biomedical engineering can be obtained at the BME Undergraduate Office on the second floor of Goergen Hall or on our Web site at www.bme.rochester.edu.

DEPARTMENTAL MISSION AND OBJECTIVES

Mission

Our mission is to create and disseminate knowledge in engineering related to biomedical sciences and health care applications, and to provide students with the foundational knowledge and skills that they will need to become and remain leaders in their chosen field.

Undergraduate Program Objective

The overall educational objective of our program is to develop effective practitioners in biomedical engineering and associated fields. We expect that our graduates will contribute to advancement of their chosen field, while remaining mindful of the ethical and social implications of their work. They will have confidence in their abilities to apply foundational knowledge in the basic sciences, mathematics, engineering analysis, and design to address a wide range of problems in medicine and biology. In keeping with the continuously evolving nature of the field of biomedical engineering, we expect that our alumni will engage in lifelong learning, and that many of them, inspired by research experiences as undergraduates, will continue their education in advanced degree programs.

STANDARD FOUR-YEAR PROGRAM

Graduation requirements for BME: minimum of 130 credits.

All students majoring in biomedical engineering complete a common freshman and sophomore year:

Freshman Year

Fall	**Spring**
MTH 161*	MTH 162*
CHM 131	CHM 132
BME 101	PHY 121

WRT 105 (Primary Humanities or social Writing) sciences

Sophomore Year

Fall	**Spring**		
MTH 163 or 165*	MTH 164*		
BIO 110	Basic science elective	PHY 122 or concentration	BME 201 & 201L course**
	ECE 210		
	Humanities or social sciences		

BIOMEDICAL ENGINEERING CORE COURSES

Eight core courses are required for all students majoring in biomedical engineering:

- BME 101. Introduction to Biomedical Engineering
- BME 201. Fundamentals of Biomechanics

and

- BME 201L. MATLAB for Bioengineers (1 credit)
- BME 210. Biosystems and Circuits
- BME 221. Biomedical Computation
- BME 230. Biomedical Signals and Measurements
- BME 260. Quantitative Physiology with Lab
- BME 295. BME Design Seminar (2 credits)
- BME 296. BME Senior Design

BIOMEDICAL ENGINEERING CONCENTRATION AREAS

Students choose to concentrate in one of four specialty areas. Four engineering courses forming a sequence in either Biosignals and Biosystems, Biomechanics, Cell and Tissue Engineering, or Medical Optics are required. Each concentration includes an upper-level BME course in the specialty area.

Biosignals and Biosystems

- ECE 241. Signals
- ECE 221. Electronic Devices and Circuits

or

- ECE 230. Electromagnetic Waves
- ECE 246. Digital Signal Processing
- Upper-level BME: e.g., BME 251/451, Biomedical Ultrasound; BME 452, Medical Imaging

Biomechanics

- ME 226. Solids
- ME 225. Fluid Mechanics
- ME 123. Thermodynamics
- Upper-level BME: e.g., BME 283/483, Biosolid Mechanics

Cell and Tissue Engineering

- CHE 243. Fluid Dynamics
- CHE 244. Heat & Mass Transfer
- CHE 225. Thermodynamics
- Upper-level BME: e.g., BME 262/462, Cell and Tissue Engineering

Medical Optics

- OPT 241. Geometrical Optics
- OPT 261. Interference & Diffraction
- OPT 262. Electromagnetic Theory or OPT 224 Laser Systems
- PHY 123. Wave and Modern Physics
- Upper-Level BME: e.g., OPT 448, Principles of Eye Design; OPT 276, Biomedical Optics; or BME 270, Biomedical Microscopy

In addition to concentration-area courses, students are required to complete the following basic science, math, and distribution requirements as well as electives complementing the BME courses.

One Primary Writing Requirement Course

Students are required to fulfill the University primary writing requirement. Typically, the course WRT 105 is used for this requirement.

Basic Sciences and Mathematics
- Four math courses: MTH 161, 162, 163/165, 164
- Two chemistry courses: CHM 151, 152
- Two physics courses: PHY 121, 122
- One biology course: BIO 110

Basic Science Electives (12 credit hours)
All students must complete at least three additional courses (at least 12 credit hours) in the basic sciences beyond the required introductory biology (BIO 110), chemistry (CHM 131 and 132), and physics (PHY 121/141 and 122/142) courses. Any biology, microbiology, neuroscience, chemistry, or physics course with a number greater than 109 may be used to fulfill this requirement (excluding BIO 111, 112, 113). At least two of these courses must have a laboratory component. At least two courses must be life science courses (i.e., biology, microbiology, neuroscience). Students are encouraged to choose their basic science electives to complement their BME concentration area. Independent study courses cannot be used to satisfy this requirement. Contact department for further details.

Humanities and Social Sciences
Students must take four courses in the humanities and/or social sciences. Three of these courses must complete an approved cluster.

Technical Elective (4 credit hours)
Students are required to take 4 credit hours of *engineering* coursework. Suitable courses must have significant engineering design, analysis, synthesis, or technical components. Classes that are primarily mathematics or science courses may not be used. Classes that are equivalent to core or concentration courses are disallowed, e.g., ME 225 (Fluid Mechanics) cannot be used as a technical elective when CHE 243 (Fluid Dynamics) has already been taken to fulfill the concentration requirements and vice versa. Courses that are cross-listed with non-engineering departments (e.g., CHE 277/AAS277) *must* be taken under the EAS registration. The following courses *may not* be used towards the technical elective requirement for one or more of the reasons above: ECE 111, 113, 399; CHE 211, 290; ME 120, 163, 164, 202, 211; OPT 287; any EAS course.

ADMISSION REQUIREMENTS

To be considered for admission to the biomedical engineering major a student must have taken courses to enable writing of a program of study that satisfies the requirements of the program and that can be completed in a total of four years.

The minimum requirements for admission to the BME program are
- satisfactory completion of BME 101 (by the end of the sophomore year)
- two engineering courses (usually ECE 210, BME 201 and 201L)
- a minimum GPA of 2.30 in these three courses
- satisfactory completion of the basic science and math requirements
- a minimum overall cumulative GPA of 2.0
- satisfactory completion of the University primary writing requirement
- completion of Career Planning Form

MINOR IN BIOMEDICAL ENGINEERING

The biomedical engineering minor provides substantive exposure to the biological and engineering sciences and gives students a basic perspective on the complex structure and function of living systems and their analysis by physical and engineering principles. The minor is available to students in all majors. , but engineering and biology students find it easier to complete these requirements. Students may not use more than two of the courses required for the BME minor to also satisfy requirements in their major (including technical electives). All students that propose a minor in BME must fulfill the basic math requirements (MTH 163/165).

Biological Science Courses (8 credit hours)
Students must complete two life science courses (i.e., biology, microbiology, or neuroscience above 110).
Engineering Courses (12 credit hours)
Choose three courses, two of which *must be BME* courses. You may also use any 400-level BME courses or cross-listed courses.

Note: Students are warned to confirm that all prerequisites for the courses below are fulfilled.
- BME 201 and 1-credit lab. Fundamentals of Biomechanics/MATLAB for Bioengineers

- BME 218. Introduction to Neuroengineering
- BME 221. Biomedical Computation
- BME 228. Physiological Control Systems
- BME 230. Biomedical Signals and Measurements
- BME 251. Biomedical Ultrasound
- BME 260. Quantitative Physiology w/Lab
- BME 262. Cell and Tissue Engineering
- BME 283. Biosolid Mechanics
- BME 391. Independent Study
- CHE 243 or ME 225. Fluid Dynamics/Introduction to Fluid Dynamics
- CHE 259. Transport Phenomena in Biological Systems
- ECE 210 or 113. Circuits for Scientists and Engineers/Circuits and Signals
- ME 226. Introduction to Solid Mechanics
- OPT 224. Laser Systems
- OPT 241. Geometrical Optics

B.S.-M.S. PROGRAM

Early admission to the master's degree program is possible for exceptionally well-qualified undergraduate majors at the University of Rochester. Students must apply by April 1 of their junior year for admission to the program. The standard application for graduate study should be used. In addition, a proposed program of study and an essay describing the goals and rationale for advanced study should be provided as part of the application. Partial tuition scholarships are available on a competitive basis for the fifth year of study only.

Admission to the 3-2 program provides the student with some flexibility in scheduling courses in the senior and fifth years of study. With the appropriate approvals, up to two fall courses required for the undergraduate degree may be deferred until the fall of the fifth year. The University requires that all requirements for the bachelor's degree must be completed before the start of the spring semester of the fifth year of study. Courses taken during the first four years of study that are not needed to fulfill the requirements for the bachelor's degree may be applied toward the master's degree program of study with the approval of the BME Graduate Committee. All students in this program are expected to serve as teaching assistants for one semester.

University of Rochester graduates who are not admitted to the 3-2 program may apply during their senior year for admission to the master's program. All applicants are considered for available tuition scholarships in any given year. Teaching experience as a teaching assistant for at least one semester is required.

UPPER-LEVEL WRITING REQUIREMENT

Upper-level writing requirements are satisfied through BME 221, BME 230, BME 260, BME 296, and the upper-level BME courses.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

101. Introduction to Biomedical Engineering. An introductory overview of the multidisciplinary field of biomedical engineering. Application of elementary engineering principles to the analysis of physiological systems. Includes basic introduction to the use of computers as tools for solving engineering problems. Course topics include biomechanics, cell and tissue engineering, biosignals and bio-instrumentation, medical imaging, medical optics, and bioethics. Includes some guest lectures by biomedical engineering faculty. (Fall)

201. Fundamentals of Bioengineering. Teaches static and dynamic rigid-body mechanics with applications in prosthetics, human movement, and other biomedical topics. Prerequisites: MTH 161 and 162, BME 101, PHY 121. (Fall)

201L. MATLAB for Biomechanics. Credit—1 hour. This half-semester laboratory provides students with the foundation in computer programming required to complete the BME 201 student project. The lab introduces the MATLAB-interpreted language through lectures, computer laboratory procedures, and assignments. Particular emphasis is placed on the use of MATLAB for both the computation and the effective presentation of scientific data and results. Topics include variables, functions, vector and matrix syntax, flow control, logical tests, graphics, and data file access. Concurrent with 201. (Fall)

210. Biosystems and Circuits. Introduction to electrical circuit theory. Examples include bioelectric systems and signals and models of biological systems.

218/418. Introduction to Neuroengineering. This course introduces many aspects of neuroengineering research, with an emphasis on biologically plausible models of neurons, circuits, and systems. The course begins with a brief review of passive membrane properties and Hodgkin-Huxley channel dynamics, and extends to advanced topics including neural circuits, control systems, and

biologically plausible neural models of behavior. There is an emphasis on theory, modeling, and simulation of single neurons, neural networks, and systems.

221. Biomedical Computation. The application of numerical and statistical methods to model biological systems and interpret biological data, using the MATLAB programming language. Prerequisites: BME 201 and 201L, or permission of instructor. (Fall)

228/448. Physiological Control Systems. The course focuses on the application of control theory to physiological systems. Lectures present modern control theory in the context of physiological systems that utilize feedback mechanisms. Lectures begin with an overview of linear systems analysis including Laplace Transforms and Transfer functions. The response dynamics of open- and closed-loop systems such as the regulation of cardiac output and level of glucose are discussed. Other topics include stability analysis and identification of physiological control systems. (Spring)

230. Biomedical Signals and Measurements. This course examines the array of instrumentation and techniques used in the acquisition, processing, and presentation of biomedical signals. Topics include transducers, sensors, Fourier analysis, the ECG signal, flow measurement, medical imaging, and biosensors. Laboratory sessions cover amplifiers, bridge circuits, and the measurement of physical parameters (temperature, pressure, strain) and electrophysiological signals. Prerequisites: ECE 113 or 210, or permission of instructor. (Spring)

251/451. Biomedical Ultrasound. The physical basis for the use of high-frequency sound in medicine (diagnosis, therapy, and surgery) and biology. Topics include acoustic properties of tissues, sound propagation (both linear and nonlinear) in tissues, interactions of ultrasound with gas bodies (acoustic cavitation and contrast agents), thermal and nonthermal biological effects of ultrasound, ultrasonography, dosimetry, hyperthermia, and lithotripsy. Prerequisites: MTH 163, MTH 164, PHY 122, or permission of instructor. (Spring)

260. Quantitative Physiology with Lab. A quantitative, model-oriented approach to physiological systems is presented. Topics include the cell and its chemistry, muscle and nerve tissue, the cardiovascular system, the respiratory system, the renal system, and a variety of neural systems. Prerequisite: ECE 113 or ECE 210 or permission of instructor. (Fall)

262/462. Cell and Tissue Engineering. This course teaches the principles of modern cell and tissue engineering with a focus on understanding and manipulating the interactions between cells and their environment. After a brief overview of cell and tissue engineering, the course covers five areas of the field. These are (1) physiology for tissue engineering; (2) bioreactors and biomolecule production; (3) materials for tissue engineering; (4) cell cultures and bioreactors; and (5) drug delivery and drug discovery. Within each of these topics the emphasis is on analytical skills and instructors assume knowledge of chemistry, mass transfer, fluid mechanics, thermodynamics, and physiology consistent with the cell and tissue engineering track in BME. In a term project, students must present written and oral reports on a developing or existing application of cell and tissue engineering. The reports must address the technology behind the application, the clinical need, and any ethical implications. Prerequisites: BME 260, CHE 225, CHE 243, CHE 244, or permission of instructor. (Spring)

270. Biomedical Microscopy. This course covers the principles and practice of light microscopy as applied to biological and medical questions. Topics include basic light microscopy, epifluorescence, confocal and multiphoton laser-scanning microscopy, and selected methods such as CARS, FRET, FRAP, FCS, etc. This course is cross-listed with BME 470 with added homework problems.

283/483. Biosolid Mechanics. Application of engineering mechanics to biological tissues including bone, soft tissue, cell membranes, and muscle. Realistic modeling of biological structures, including the heart, cells, and musculoskeletal joints. Experimental methods and material models. Same as ME 483 and BPH 483. Prerequisites: ME 226, BME 201, and 201L. (Fall)

295. Design Seminar. Credit—2 hours. Introduction to design of medical devices and instruments. Students are introduced to methods and strategies for creative design while considering ethical, economic, regulatory, and safety issues. In addition to benchmarking existing devices, students prepare for a design project to be completed in the following semester. Prerequisites: math, science, and engineering courses appropriate for fourth-year students in BME. (Fall)

296. BME Design Project. Senior capstone design course in the Biomedical Engineering Program. Students work in teams to design, build, and test projects in biomedical engineering. Progress reports, a written final report, and a final oral presentation of the project are required. Prerequisites: math, science, and engineering courses appropriate for fourth-year students in BME, BME 295, BME 260, or permission of instructor. (Spring)

391. Independent Study.

The following graduate courses are open to advanced undergraduates with permission of the instructor.

442. Cell Motility and Molecular Machines. Credit—2 hours. From single molecule motors transporting materials within cells to contracting muscle fibers, molecular engines come in a range of sizes and produce some of the most fascinating phenomena in biology. This course teaches the modern theories behind molecular engines, presuming only an elementary background in cell biology and mechanics. (Spring)

452. Medical Imaging—Theory and Implementation. Physics and implementation of X-ray, ultrasonic, and MR imaging systems. Special attention is given to the Fourier transform relations and reconstruction algorithms of X-ray and ultrasonic-computed tomography, and MRI. Prerequisites: ECE 242. (Spring)

453. Advanced Biomedical Ultrasound. This course investigates the imaging techniques applied in state-of-the-art ultrasound imaging and their theoretical bases. Topics include linear acoustic systems, spatial impulse responses, the k-space formulation, methods of acoustic field calculation, dynamic focusing and apodization, scattering, the statistics of acoustic speckle, speckle correlation, compounding techniques, phase aberration correction, velocity estimation, and flow imaging. A strong emphasis is placed on readings of original sources and student assignments and projects based on realistic acoustic simulations. (Fall)

466. Microhydrodynamics. Credit—3 hours. This course examines the unique physics of fluid flow and mass transport in microscale geometries. Such behavior is relevant to many engineering applications from microelectronics cooling to lab-on-a-chip biotechnology. Specific topics include electrokinetic effects on fluid flow, the motion of small suspended particles, and microscale bioreactors. Same as CHE 466. Prerequisites: MTH 161, 162, 163/165, 164, and CHE 243 or equivalent. (Spring)

485. Membrane Mechanics and Cell Adhesion. Credit—2 hours. This course focuses on the fundamental science underlying the mechanical behavior of cell membranes and the formation of adhesive contacts between cells and between cells and substrates. Our approach is to explore mathematical descriptions of the physical properties of biomembrane structures as well as the physics and chemical basis of cell adhesion. Basic aspects of the structure and composition of cell membranes and the classes of adhesion molecules found on cells are reviewed as a basis for the mathematical treatments. The course is typically taught in the first half of the spring semester and designed for upper-level undergraduates and graduate students. Prerequisite: some background in mechanics and cell biology recommended. (Spring)

CHEMICAL ENGINEERING

Shaw-Horng Chen, Ph.D. (Minnesota) *Professor of Chemical Engineering and of Materials Science and Senior Scientist in the Laboratory for Laser Energetics*

Eldred H. Chimowitz, Ph.D. (Connecticut) *Professor of Chemical Engineering*

Jehuda Greener, Ph.D. (Massachusetts, Amherst) *Adjunct Professor of Chemical Engineering*

David R. Harding, Ph.D. (Cambridge, England) *Professor of Chemical Engineering and Senior Scientist in the Laboratory for Laser Energetics*

Stephen D. Jacobs, Ph.D. (Rochester) *Professor of Chemical Engineering, of Materials Science, and of Optics and Senior Scientist in the Laboratory for Laser Energetics*

Jacob Jorné, Ph.D. (California, Berkeley) *Professor of Chemical Engineering*

Lewis J. Rothberg, Ph.D. (Harvard) *Professor of Chemistry, of Chemical Engineering, and of Physics*

Yonathan Shapir, Ph.D. (Tel Aviv, Israel) *Professor of Physics, of Mathematics, and of Chemical Engineering*

Ching W. Tang, Ph.D. (Cornell) *Doris Johns Cherry Professor, Professor of Chemical Engineering, of Physics, and of Chemistry*

J. H. David Wu, Ph.D. (M.I.T.) *Professor of Chemical Engineering, of Biomedical Engineering, and of Microbiology and Immunology*

Hong Yang, Ph.D. (Toronto) *Associate Professor of Chemical Engineering*

Matthew Z. Yates, Ph.D. (Texas) *Associate Professor of Chemical Engineering*

Mitchell Anthamatten, Ph.D. (M.I.T.) *Assistant Professor of Chemical Engineering and Scientist in the Laboratory for Laser Energetics*

Thor Olsen, Siv.Ing. (Technical University of Norway) *Instructor in Chemical Engineering and Laboratory Supervisor*

Ben W. Ebenhack, M.S. (Wyoming) *Senior Lecturer in Chemical Engineering*

Richard Frederick Eisenberg, M.S. (Rochester) *Professor Emeritus of Chemical Engineering*

Chemical engineers apply the chemical and physical sciences to the solution of practical problems. They often work in business and industry but also use their engineering backgrounds in a wide variety of other occupations including the legal and medical professions. Some of our recent graduates work as environmental engineers, design biochemical proc-esses, and develop new materials or processing methods for the microelectronics industry.

The versatility demanded of chemical engineers requires that their abilities to use the basic sciences be especially well developed. Moreover, because the solutions to society's problems frequently involve questions which transcend technical considerations and because our faculty is committed to a true university education for chemical engineering students, the curriculum is designed to

include humanities and social sciences as well as the physical and biological sciences, mathematics, and engineering.

Courses in chemical engineering (CHE) are coordinated with separate chemical engineering laboratory courses in the junior and senior years. In these lab courses, students explore fundamental concepts learned in lectures, and gain experience in problem definition and experiment design in a project format. All laboratories make extensive use of microcomputers for data acquisition and analysis, complementing their use for computation in other courses.

For admission to a concentration in chemical engineering, the student is required to have a grade-point average of 2.15 in all chemistry and chemical engineering courses taken during the first four semesters. For graduation a student must earn a grade-point average of 2.0 in all chemical engineering courses in addition to having an overall average of 2.0.

The faculty of the Department of Chemical Engineering recognize achievement among our graduates by noting those who graduate with distinction based upon their average grades in their core CHE courses. In particular, students who have a GPA of 3.85 or higher in the core CHE courses will receive their degrees with Highest Distinction; those with GPAs between 3.60 and 3.84 will be noted to have achieved High Distinction; and those who have GPAs between 3.25 and 3.59 will receive Distinction.

A *minor in chemical engineering* is available and is especially useful for students interested in technical management or careers which involve the assessment of technology and society.

The chemical engineering department also offers minors in *environmental engineering* and *biomedical engineering* for students interested in the application of engineering and scientific principles to environmental issues.

EDUCATIONAL GOALS OF THE PROGRAM IN CHEMICAL ENGINEERING

- To educate students in the **core chemical engineering and basic science** subjects that constitute the modern intellectual basis for the chemical engineering profession.
- To educate students in methods of engineering analysis and design in an environment where **problem solving, teamwork, and communication skills** are emphasized.
- To provide students with knowledge and counseling that prepare them for admission to **graduate programs in science and engineering, as well as professional employment in industry.**
- To provide students with breadth in their education and a context in which to appreciate the **potential lifelong societal contributions** in their practice of the chemical engineering profession.

ADVISING

Each student is assisted by a faculty advisor in planning an individual program of study, especially in the choice of electives. Faculty advisors help students to make sure that programs satisfy minimum degree requirements and, in addition, the minimum professional accreditation requirements of the Accreditation Board for Engineering and Technology (ABET) and of the American Institute of Chemical Engineers (AIChE). Chemical engineering students are required to meet with their advisor each semester and demonstrate how their selection of courses will be used to meet department and accreditation requirements.

ELECTIVES

The B.S. program is described on the department's Web site: www.che.rochester.edu. It consists of the equivalent 123 credit hours of coursework plus two chemical engineering laboratories (for 6 credits), and an organic chemistry laboratory (the minimum number of credit hours being 130). Eleven courses (44 credit hours) in the four-year program are electives. One elective is a free elective (4 credit hours) and may be chosen however the student wishes. Five electives (that is, 20 credit hours) must be in the humanities or social sciences, with some courses selected in each area to provide breadth in the student's program of study. Chemical engineering majors also must complete at least one approved cluster in a nontechnical subject area, in compliance with graduation requirements in the College. Generally students choose to meet this cluster requirement by a judicious selection of their five humanities and social science electives. This option may not be possible for those who choose to do a cluster in business. An alternative is to earn a minor in a humanities or social science discipline. ENG 101 and 111–129 do not count toward this nontechnical course requirement in the chemical engineering program. The five remaining electives (20 credit hours) are chosen from technical courses in consultation with faculty advisors. These technical electives are subject to the following restrictions:

1. One course must be in applied mathematics. MTH 164 is required.

2. One course (4 credits) must be in advanced chemistry or biology/biochemistry or earth and environmental sciences to supplement the four required chemistry courses explicitly identified in the typical four-year program below. In addition, chemistry-related courses in the chemical engineering department, such as CHE 280, 286, and 287, and certain courses in other departments, for example EES 215, 217, and 218, may be used as an advanced chemistry elective.

3. The three remaining technical courses (12 credits) must be science/engineering courses.

Chosen to broaden the student's engineering background or to pursue an area of special personal interest in more depth, these courses are usually completed in the junior and senior years and normally do not include more than one course at the 100 level.

Qualified undergraduates should consider 400-level graduate courses, or personal research or design projects as technical electives, particularly if they are considering an application to the department's 3-2 B.S.-M.S. program. Students are urged to consult widely and select their technical electives carefully. The department provides many opportunities for undergraduate students to pursue more in-depth study with individual faculty members. This can take on the form of independent research courses (CHE 395) or paid research internships over the summer months. Department strengths and focus areas include

biotechnology—problems of common interest to biologists, biochemists, physicians, and engineers
polymers and advanced materials—their structure, properties, and manufacture
energy resources—fossil fuels, their production, chemical processing, and uses; other sources: solar and fuel cells, hydroelectric, geothermal, etc.
systems and controls—the behavior of complex chemical processes and their online control
environmental engineering—engineering methods applied to community or ecological problems
surface chemistry and catalysis—unique properties of interfaces separating solids, liquids, and gases
computer applications—computer use in chemical processing systems.

COMPUTER COMPETENCY

All chemical engineering students are required to develop competency in computational analysis and the use of mathematical programming languages. In addition, students must become familiar with the use of microcomputers. These requirements should be met before entering the third year of undergraduate study. Typically, minimum competency is achieved by successfully completing CHE 116, Fundamentals of Computing. The course introduces students to programming methods useful in simulation work and numerical computation encountered in upper-level lecture and design courses.

As an alternative to CHE 116, students may fulfill this requirement by earning at least a B– in CSC 171 or equivalent, or by having earned a 4 or 5 on the AP Computer Science exam. Such students must complete 2 credits of a free elective in place of the CHE 116 requirement.

FIRST-YEAR CHE COURSES

The chemical engineering department provides ways for new students to gain a better understanding of what chemical engineers do. In the spring term, a chemical engineering elective, CHE 150, is taught to introduce students to problems where chemical engineering ideas are used to solve technical problems in an informal, project-oriented setting. In addition, several informal meetings are organized throughout the school year, in conjunction with the student chapter of the AIChE, to introduce students to professionals in local industry, so that students may gain a perspective on the wide variety of career opportunities open to chemical engineering graduates.

MINOR IN CHEMICAL ENGINEERING

The minor in chemical engineering is especially appropriate for chemistry, mechanical engineering, and environmental science majors who want to broaden their background for work in the chemical process industry. It is also useful for students interested in technical management or careers that involve the assessment of technology and society. The minor consists of a coherent sequence of 24 credits subject to the following restrictions:

1. Required background: CHM 131 and MTH 161 or equivalent.
2. 16 credits of chemical engineering courses from the following:

CHE 113	CHE 250
CHE 213	CHE 258 (2 credits)
CHE 225	CHE 282 (2 credits)
CHE 243	CHE 259
CHE 244	CHE 286
CHE 231	CHE 287

3. Exception: Biomedical degree students with a Cell & Tissue Concentration are required to take two courses in addition to CHE 225, 243, and 244.

MINOR IN ENVIRONMENTAL ENGINEERING

1. Required background: CHM 131 and MTH 161 or equivalent.
2. 8 credits of chemical engineering courses from the following:

CHE 150	CHE 277
CHE 278	CHE 281K

3. Two courses from the following:

BIO 102	EES 201

EES 205	EES 214
EES 215	EES 217
EES 218	EES 219
EES 318	TOX 521

CHEMICAL ENGINEERING MAJOR WITH BIOMEDICAL MINOR

1. Required background: MTH 161, 162, and 165, CHM 131, and 132, and PHY 121 and 122 or equivalent.

2. Seven required courses:

BME 101	CHE 243
BIO 110	Two BME
BIO 111	Technical electives
BIO 111L	

TYPICAL FOUR-YEAR PROGRAM

First Year

MTH 161	MTH 162
CHM 131	CHM 132
Elective	PHY 121
WRT 105 (Primary Writing)	
	CHE 150

Second Year

MTH 164	MTH 165
CHM 203	CHE 243
CHE 207	CHM 116
CHE 113	CHM 204/BIO/
Elective	EES equivalent
	Elective

Third Year

CHE 244	CHE 231
CHE 225	CHE 250
PHY 122	CHE 279
Elective	CHE 246
	Elective

Fourth Year

CHE 273	CHM/BIO/EES elective
CHE 255	CHE 272
CHM 251	Elective
Elective	Elective

UPPER-LEVEL WRITING REQUIREMENT

All students in the College must satisfy an upper-level writing requirement. Chemical engineering majors meet this requirement within the context of the two laboratory courses and the capstone design course (CHE 246, 255, and 273), all of which emphasize technical writing as well as oral communication and help students to refine these skills.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

113. Chemical Process Analysis. Methodology and problem-solving techniques in chemical engineering; the concepts of mass and energy conservation in both reacting and nonreacting chemical systems; the concept of equilibrium in chemical and physical systems, and the basic principles of thermodynamics are presented. Both steady-state and transient behavior are discussed for some special systems. Lectures and discussion. Prerequisites: CHM 131, MTH 161 or 162. (Fall)

116. Fundamentals of Computing.

Credit—2 hours. This seven-week course provides an introduction to Microsoft Excel and its powerful VBA (Visual Basic for Applications) programming environment. Although chemical engineering concepts are integrated into the curriculum, no prior chemical engineering experience is required. This course is of value to engineers and analytically oriented individuals of many disciplines. Students

learn and apply a number of general tools/approaches that will facilitate analytical problem solving in a wide variety of situations. Although no prior Excel or programming experience is required, the course does provide instruction on a select set of more advanced topics such as nonlinear curve -fitting and nonlinear optimization. (Spring)

150. Green Engineering for a Sustainable Environment. This course introduces the issue of green engineering ideas in pursuit of "sustainable technology," which is emerging as a critical technology in advanced industrial societies. By sustainable technology we mean the development of environmentally benign processes that have minimal adverse impact on the surrounding earth's ecosystem. (Spring)

211. Probability for Chemical Engineers. Credits—2 hours. This course provides an introduction to probability theory applied to engineering problems. Students study the basic elements of probability theory including the properties of special random variables like the Normal, Poisson, and Exponential distributions. Applications to chemical/environmental engineering problems are discussed as well as the use of statistical simulations using Wiener sampling methods. (Spring, alternate semesters)

213. Engineering of Soft Matter. This course provides an overview of several contemporary research topics pertaining to structured organic materials. Lectures focus on intermolecular interactions and the thermodynamics of self-assembly. Additional lectures introduce molecular crystals, self-assembled monolayers, surfactants, block copolymers, and biomimetic materials. Homework assignments and a brief technical undergraduate students are welcome. Same as CHE 413. (Spring)

225. Chemical Engineering Thermodynamics. Lectures on the origin and use of the first and second laws of thermodynamics, followed by a discussion of equilibrium criteria. Thermodynamic descriptions of real gases and liquids are developed and applications of thermodynamics to phase and chemical equilibria complete the course. (Fall)

231. Chemical Reactor Design. Review of chemical kinetics; methods of kinetic data collection, analysis, and interpretation; calculation of simple reactor designs. Emphasis is on homogeneous uncatalyzed reactions, but heterogeneous and catalyzed reactions are considered. Prerequisites: MTH 165, CHE 113. (Spring)

243. Fluid Dynamics. Basic principles of fluid flow, conservation of mass, momentum, laminar flow problems, dimensional analysis, macroscopic balances, and design of fluid flow systems. Prerequisites: PHY 121, MTH 165. (Spring)

244. Heat and Mass Transfer. A fundamental course in heat transfer processes and an introduction to mass transfer. Topics include equations of energy conservation, conduction, convection, radiation; equations for chemical species conservation, diffusion, macroscopic balances. Emphasis on problem solving, especially for purposes of design. Prerequisites: CHE 243, MTH 165, fluid mechanics. (Fall)

246. Laboratory in Chemical Engineering Principles. Credit—3 hours. Hands-on experience with concepts in phase equilibrium, heat and mass transfer, and chemical kinetics. Emphasis on measurement techniques, computing for real-time data acquisition, data analysis, and experimental design. Involves structured experiments, open-ended projects, and oral and written reports. Prerequisites: MTH 161, 162, CHM 131 or equivalent. (Spring)

250. Separation Processes. Application of mass transfer and thermodynamics to chemical separation techniques. Fundamentals and design of processes such as distillation, absorption, extraction, and crystallization. Fixed-bed operations, such as ion exchange and chromatography, and membrane processes are also considered. Prerequisites: CHE 113, 244. (Spring)

255. Laboratory in Chemical Engineering Processes. Credit—3 hours. Operation and scale-up of chemical process equipment for chemical reaction and purification. Examination of the factors that affect performance in practice. Exploratory experiments and preliminary experimental design, as well as oral and written reports, are required. Prerequisites: CHE 234, 244, 231, 250. (Fall)

258. Electrochemical Engineering and Fuel Cells. Credit—2 hours. The course concentrates on presenting the principles of electrochemistry and electrochemical engineering, and the design considerations for the development of fuel cells capable of satisfying the projected performance of an electric car. The course is expected to prepare students for the challenges of energy conversion and storage and the environment in the twenty-first century. (Fall, half semester)

259. Transport Phenomena BIO
Systems. Credit—4 hours. This course provides an overview of transport phenomena in biological systems that are critical to the function of all living organisms. The fundamental laws and equations of transport phenomena are applied to topics including cellular, cardiovascular, respiratory, liver and kidney transport, blood flow and rheology, and circulation in tissues and arteries. (Fall)

272. Process Dynamics and Control. Credit—2 hours. Lectures, problem sets, and design projects. Introduction to the dynamic behavior of chemical engineering systems and to the analysis of feedback control systems. Methods of design of single feedback loops and multivariable systems are covered. Prerequisite: CHE 113. (Spring)

273. Chemical Engineering Process Design I. The course covers material related to the conception and design of chemical processes. Topics include energy systems analysis, the attainability region approach for reactor network synthesis, and the effects of statistical uncertainty on decision making when evaluating alternative designs. Modern techniques for stochastic simulation of random processes are also studied. The use of computational software packages like MATHCAD and DESIGN II is expected in doing many of the homework assignments. In addition to two examinations, a computer-oriented design project is assigned involving the use of chemical engineering principles for the solution of a process flow sheet problem. Prerequisite: senior standing in chemical engineering. (Fall)

277. Energy Resources and Utilization. Emphasis on technical and development aspects of energy resource problems. Applications of resource exploration and development in energy prospective locales that lack commercial energy development such as the

rift basins and embayments of Africa. Consideration of quality-of-life impacts of energy. Problems considered include combustion of fossil fuels for heat and work, combustion products and environmental impact, comparison of fuels on environmental grounds, benefits of energy in social development, technology of energy exploration and development, and economics of energy development and acquisition. Same as AAS 277. (Spring)

278. Energy Alternative Lab. Students are presented with issues and technical problems in developing a more sustainable energy mix for a variety of societal needs. They conduct and design experiments which test various kinds of alternatives, including conservation technologies. The first few weeks involve discussion of the issues and two or three common experiments for the entire class. One project involves numerical modeling of a system. The remainder of the course involves extensive design and evaluation of a concept chosen by the student group. (Fall)

279. Chemical Engineering Practice. Credit—1 hour. Issues of relevance to the practice of chemical engineering. Topics include basic economic principles and marketing issues, ethics, plant safety, worker education and training, and environmental implications in process designs. Students visit a local industry to gain perspective on the scale of a chemical process. Presentations by practicing engineers demonstrate the versatility of a chemical engineering education. (Spring)

280. Materials Engineering and Mechanical Design. Preparation, structure, composition, and properties of advanced materials with emphasis on the underlying chemistry. Atomic structure and bonding of crystalline and amorphous solids and crystalline defect. Materials synthesis and processing by chemical and physical deposition methods. Focus on the relation of structure to properties of materials. Selected topics to illustrate the basic concepts and principles include thin film materials, nanostructure/nanoscale/nanocomposite materials, and bulk materials. Same as CHE 480. (Spring)

281K. Solving the University's Environmental Footprint. The intent of the course is to develop marketable concepts for the University of Rochester to consider as opportunities to reduce its impact on the local and global environment. Students establish teams to analyze data on the energy consumption and greenhouse gas emission of the University from facilities operations and transportation. This situation analysis covers direct financial costs and indirect external and societal effects. Based on the audit, the student teams identify opportunities for reducing energy consumption and greenhouse gas emission and then assess their proposed solutions in terms of cost-effectiveness, technical feasibility, and consumer values and motivation to participate in more sustainable solutions. The course is for students with a commitment to doing something meaningful about sustainability globally and locally in Rochester. The student process of developing solutions is guided by a multidisciplinary team of faculty with expertise in architecture, business, engineering, and social science. The faculty team does not lecture in traditional manner but provides data on University facilities operations; training in team-building; and consultation on business analysis, life-cycle energy analysis, cultural analysis and market research, and persuasive business presentations. At the end of the course, student teams present the results of their work to University facilities management for action to reduce the environmental footprint of the University. (Spring)

282. Processing of Microelectronic Devices. Credit—2 hours. An overview of processes used in the fabrication of microelectronic devices, with emphasis on chemical engineering principles and methods of analysis. Modeling and processing of microelectronic devices. Includes introduction to physics and technology of solid-state device grade silicon, microlithography, thermal processing, chemical vapor deposition, etching and ion implantation, and damascene processing. Same as CHE 482, MSC 438. (Fall, half semester)

286. Polymer Science and Technology. This course features the science and technology of synthetic macromolecules. Topics include polymerization reactions, structure and properties of semicrystalline and amorphous polymers, characterization of structure and properties, structure-property relationship in polymers, and applications of polymeric materials. Same as CHE 486, MSC 224, MSC 433. (Fall)

287. Polymer Rheology and Processing. This course provides an overview of polymer rheology with emphasis on application to polymer processing. Basic principles of rheology are discussed and general methods for rheological characterization of liquid and solid polymers are described and analyzed. The rheological principles are then applied, together with standard conservation laws, to the analysis and derivation of basic models for several key polymer fabrication processes, e.g., coating, extrusion, injection molding and film stretching. The unique transport and equilibrium properties of organic polymers are studied and applied, with basic chemical engineering principles, to the analysis of polymer processing. Topics include fluid flow and heat transfer in polymer systems, rheological equations of polymer systems, rheological equations of state, and the study of fabricating operations, such as calendaring, extrusion, and injection molding. Same as CHE 487, MSC 434. (Spring, alternate years)

The following graduate courses are open to advanced undergraduates with permission of the instructor.

411. Introduction to Probability for Chemical Engineers. Credit—2 hours.

413. Engineering of Soft Matter.

421. Thin-Film Processing.

430. Organic Electronics

447. Optics and Liquid Crystals for Chemical Engineers.

454. Interfacial Engineering.

458. Electrochemical Engineering and Fuel Cells.

462. Cell and Tissue Engineering.

466. Microhydrodynamics. Credit—3 hours.
469. Biotechnology and Bioengineering.
480. Chemistry of Advanced Materials.
482. Processing of Microelectronic Devices. Credit—2 hours.
486. Polymer Science and Engineering.
487. Polymer Rheology and Processing.

COMPUTER SCIENCE

James F. Allen, Ph.D. (Toronto) *John H. Dessauer Professor of Computer Science, and Professor of Brain and Cognitive Sciences and of Linguistics*
Christopher M. Brown, Ph.D. (Chicago) *Professor of Computer Science*
Sandhya Dwarkadas, Ph.D. (Rice) *Professor of Computer Science and of Electrical and Computer Engineering*
Lane A. Hemaspaandra, Ph.D. (Cornell) *Professor of Computer Science*
Robert A. Jacobs, Ph.D. (Massachusetts) *Professor of Brain and Cognitive Sciences, of Psychology, of Computer Science, and in the Center for Visual Science*
Henry A. Kautz, Ph.D. (Rochester) *Professor of Computer Science; Chair of the Department*
David C. Knill, Ph.D. (Brown) *Professor of Brain and Cognitive Sciences, of Computer Science, and in the Center for Visual Science*
Lenhart K. Schubert, Ph.D. (Toronto) *Professor of Computer Science*
Michael L. Scott, Ph.D. (Wisconsin) *Professor of Computer Science*
Chen Ding, Ph.D. (Rice) *Associate Professor of Computer Science*
Daniel Gildea, Ph.D. (California, Berkeley) *Associate Professor of Computer Science*
Wendi B. Heinzelman, Ph.D. (M.I.T.) *Associate Professor of Electrical and Computer Engineering and of Computer Science; Dean of Graduate Studies*
Michael Huang, Ph.D (Illinois at Urbana/Champaign) *Associate Professor of Electrical and Computer Engineering and of Computer Science*
Randal C. Nelson, Ph.D. (Maryland) *Associate Professor of Computer Science*
Joel I. Seiferas, Ph.D. (M.I.T.) *Associate Professor of Computer Science*
Kai Shen, Ph.D. (California, Santa Barbara) *Associate Professor of Computer Science*
Jeffrey Bigham, Ph.D. (Washington) *Assistant Professor of Computer Science*
T. Florian Jaeger, Ph.D. (Stanford) *Assistant Professor of Brain and Cognitive Sciences and of Computer Science*
Engin Ipek, Ph.D. (Cornell) *Assistant Professor of Computer Science and of Electrical and Computer Engineering*
Christopher J. Pal, Ph.D. (Waterloo) *Assistant Professor of Computer Science*
Daniel Stefankovic, Ph.D. (Chicago) *Assistant Professor of Computer Science*
Thaddeus E. Pawlicki, Ph.D. (SUNY, Buffalo) *Lecturer in Computer Science*

The Department uses 15 to 20 teaching assistants as graders, workshop leaders, or laboratory leaders.
The Department of Computer Science offers B.A., B.S., M.S., and Ph.D. degrees in computer science.

The department offers a broad range of courses in systems, theory, and artificial intelligence. The goal is to help students become fluent in algorithmic thought, core skills and concepts, and state-of-the-art implementation techniques. All of our students have exceptional participatory access to advanced courses and to a faculty composed of prominent researchers in areas such as parallel hardware and software, programming languages, computational complexity, randomized algorithms, machine vision, and natural language processing. Research experiences play a large part in the undergraduate programs, and many B.A. and B.S. students become involved in the department's research program during their junior and senior years. Our faculty frequently helps students find jobs and internships at leading high-tech corporations and major research laboratories.

The B.S. curriculum is structured to provide a broad grounding in the conceptual and mathematical foundations of the field that are the enduring foundations of computer science. The B.A. curriculum is less structured: students may take academic advantage of the many other outstanding disciplines at the University of Rochester (e.g., music, biology, political science, brain and cognitive sciences, etc.) for which computing is a powerful enabler. There are several ways to convert B.S. to B.A. programs (and vice versa).

The Computer Science Department's Web page (www.cs.rochester.edu) has details of its academic programs (B.S., B.A, Minor, and 3-2).

INDUSTRY PRACTICUM

An elective industrial partnership program is being developed that allows students to spend up to six months (usually a summer and an adjacent semester) working in an industrial setting. Graduation thus is delayed one semester. Interested students should plan their studies to ensure that all their academic program requirements are met despite the semester away.

CLUSTERS

Computer science currently offers seven clusters:

- Foundations of Computer Science: CSC 171, 172, 173. This is the main course sequence leading into the CS majors and minor. It provides a thorough overview of foundational computer science techniques and issues. Prerequisite: none, but those with no computer experience may consider taking CSC 108 before starting this sequence.
- Theory of Computation: CSC 172, 173, 280. Emphasizes mathematical models of the computational process, limitations on what is computable, the inherent complexity of practical problems, and the design and analysis of efficient algorithms. Prerequisite: familiarity with a high-level language like C++ or Java equivalent to CSC 171.
- Computer Systems: CSC 171 or 173, 172, 252. Covers the internal organization of computers and its relation to recent computer hardware developments as well as to classical topics in computer software such as compilers and operating systems. Prerequisite: familiarity with a high-level language like C++ or Java equivalent to CSC 171.
- Business Computing: CSC 161 or 171, 108, CIS 215 or 225. An introduction to software packages, computing, and computerized business systems analysis. The mixture of programming skills and power analysis packages like Excel is a strong foundation for serious applications. Prerequisite: none.
- Computer Science and Art: CSC 108, either AH 100 or CSC 190 I and II, either CSC 161 or 171. This cluster introduces students to the use of computers in visual art.
- Computing for the Social Sciences: CSC 108, one of the following: STT 211, 212, 213, PSC 200, or 201) and either CSC 161 or 171. This cluster introduces students to powerful software packages and fundamentals of computer programming. There is a special emphasis on computation done in the context of the social sciences.
- Algorithms: CSC172, 282, and either 171 or 173. Emphasizes algorithmic thought, use of data structures, and the design and analysis of efficient algorithms.

DEPARTMENTAL DISTINCTION

Departmental distinction in computer science, for both the B.A. and B.S. degrees, will be determined by the student's GPA on the courses that constitute the program of study for the concentration. The minimum scores for the three levels of distinction will be 3.3 (Distinction), 3.5 (High Distinction), and 3.7 (Highest Distinction).

UPPER-LEVEL WRITING REQUIREMENT

Every computer science major must develop, in consultation with his or her advisor, a plan that includes two upper-level writing "experiences." Each experience must generate at least 25 pages of expository prose, with substantial feedback on content and form, and revision of the work. (The 25 pages may be in the form of a single major paper, or a series of smaller papers in a coherent context, e.g., a course.) The plan must be described in writing, on a form signed by both the student and the advisor. Full information is available from the department.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. See department's Web site: www.cs.rochester.edu. Following are some of the recent or planned offerings.

108. Introduction to Computers. A practical introduction to computing for students in the humanities, social sciences, and business. Topics covered include stand-alone applications (word processing, spreadsheets, databases); Internet tools (Web browsers, e-mail, file transfer, Web page creation); basic computer technology (how computers work, how they are programmed, what their limitations are); and broader social issues (technological trends, computer ethics, the impact of computing on society). Lab required. No prerequisites. (Fall and Spring)

161. The Art of Programming. Organized thinking, creative problem solving, and the precise description of solutions are valuable skills in academia and life. The formulation and solution of problems using computers is increasingly important in all artistic and scholarly fields. We introduce core concepts and techniques of programming as a way to develop these skills, as basis for further computer science study and for application to other fields. Lab required. Prerequisites: none. (Fall).

162. The Art of Data Structures. Understanding and utilizing standard data structures and abstractions (e.g., trees, lists, sets, vectors, stacks, and queues). Emphasizes the capabilities of various abstractions and the tradeoffs among data structures used to repre-

sent them. Lab required. Prerequisite: CSC 161 or equivalent. (Spring)

171. The Science of Computer Programming. Discovering, formulating, and exploiting the structure of problems to aid in their solution by computer—an introduction to algorithmic problem solving and computer programming in Java. Lab required. Prerequisites: none. (Fall)

172. The Science of Data Structures. Abstract data types (e.g., sets, mappings, and graphs) and their implementation as concrete data structures in Java. Analysis of the running times of programs operating on such data structures and basic techniques for program design, analysis, and proof of correctness (e.g., induction and recursion). Lab required. Prerequisite: CSC 171 or equivalent; MTH 150 is recommended. (Fall)

173. Computation and Formal Systems. The course investigates several formal systems influential in computer science and also some of their applications (e.g., inspiring and providing the foundation for a computer programming style or providing the basis for solving important practical problems like communications protocols, compiling, systems analysis, graphics). Studied in more detail: propositional and predicate logic and applications like the Prolog language and circuit design; formal languages and automata theory (FLAT) and applications like scanners and parsers, using the C Language; lambda calculus and the Scheme language with an AI application; matrices and the Matlab language, with applications in robotics or graphics. Prerequisite: CSC 172. (Spring)

190. Issues in Computing. Rotating topics in computer science that do not require prior computing experience. This course may be repeated for credit for different topics. Recent offerings include Explorations in Robotics, Scientific Programming in MATLAB, Machines of Loving Grace, Recreational Graphics, and Creative Computing. Prerequisite: none. (Fall and Spring)

200 (200H). Undergraduate Problem

Seminar (Honors). Intensive seminar on cooperative problem solving. Overview of the subdisciplines and the research of the University of Rochester's computer science faculty. Required for the B.S. in computer science. Prerequisites: all B.S. premajor requirements. (Spring)

217. Uncertain Inference. The focus of the course is the problem of quantifying the uncertainty that characterizes most inference outside of logic and mathematics. This is important to both philosophy and AI. The various probabilistic and non-probabilistic measures that have been proposed are explored and evaluated. Students in this course may receive upper-level writing credit. Prerequisite: PHL 110 or permission of instructor. Same as PHL 217. (Fall)

242. Artificial Intelligence. Introduces fundamental principles and key applications of artificial intelligence, including heuristic search, automated reasoning, machine learning, neural networks, and machine perception. Programming project includes building autonomous software angst in a virtual world. This course is a prerequisite for advanced AI courses. Prerequisites: MTH 150 and CSC 172. Same as BCS 232. (Spring)

244. Logical Foundations of Artificial Intelligence. An introduction to the logical foundations of AI, including first-order logic, search, knowledge representation, and planning. Prerequisites: CSC 173 and 242. (Fall)

246. Mathematical Foundations of Artificial Intelligence. This course presents the mathematical foundations of AI, including probability, decision theory, and machine learning. Prerequisites: CSC 242 and MTH 165. (Spring)

247. Natural Language Processing. An introduction to natural language processing: constructing computer programs that understand natural language. Topics include parsing, semantic analysis, and knowledge representation. Prerequisite: CSC 242. Same as BCS 235, LIN 247. (Fall; may not be offered every year.)

247. Natural Language Processing. An introduction to natural language processing: constructing computer programs that understand natural language. Topics include parsing, semantic analysis, and knowledge representation. Prerequisite: CSC 242. Same as BCS 235, LIN 247. (Fall; may not be offered every year.)

248. Statistical Speech and Language Processing. An introduction to statistical natural language processing and automatic speech recognition techniques. This course presents the theory and practice behind the recently developed language processing technologies that enable applications such as speech-driven dictation systems, document search engines (e.g., finding Web pages), and automatic machine translation. Prerequisites: CSC 172 and CSC 242. Same as BCS 233, LIN 248. (Fall; alternating years with CSC 247)

249. Machine Vision. Introduction to computer vision, including camera models, basic image processing, pattern and object recognition, elements of human vision. Specific topics include geometric issues, statistical models, transforms, color theory, texture, and optic flow. Prerequisites: MTH 161 and CSC 242. Same as BCS 236. (Spring; may not be offered every year)

252. Computer Organization. Introduction to computer architecture and the layering of hardware/software systems. Topics include instruction set design; logical building blocks; computer arithmetic; processor organization; the memory hierarchy (registers, caches, main memory, and secondary storage); I/O-buses, devices, and interrupts; microcode and assembly language; virtual machines; the roles of the assembler, linker, compiler, and operating system; technological trends and the future of computing hardware. Several programming assignments required. Prerequisites: MTH 150 and CSC 172. (Spring)

254. Programming Language Design and Implementation. Design and implementation of programming languages with an emphasis on imperative languages and on implementation tradeoffs. In-depth examination of how programming languages work. Topics include fundamental language concepts, compilation and interpretation, and major language paradigms. Course projects include assignments in several languages and the modification and enhancement of a working compiler. Prerequisite: CSC 173; CSC 252

recommended. (Fall)

255/455. Advanced Programming Systems. With the increasing diversity and complexity of computers and their applications, the development of efficient, reliable software has become increasingly dependent on automatic support from compilers and other program analysis and translation tools. This course covers principal topics in understanding and transforming programs at the assembly, function, and program levels. Specific topics include data flow, dependence, and inter-procedural analyses; resource allocation; and program transformation for locality and parallelism. Prerequisite: CSC 254; CSC 252 recommended. (Spring)

256. Operating Systems. Principles of operating system design, explored within the practical context of traditional, embedded, distributed, and real-time operating systems. Topics include device management, process management, scheduling, synchronization principles, memory management and virtual memory, file management and remote files, protection and security, fault tolerance, networks, and distributed computing. Prerequisite: CSC 252. (Fall)

257. Computer Networks. Architecture and protocols: introduction to computer networks and computer communication. Design of protocols for error recovery, reliable delivery, routing, and congestion control. Store-and-forward networks, satellite networks, local area networks, and locally distributed systems. Case studies of networks, protocols, and protocol families. Emphasis on software design issues in computer communication. Prerequisite: CSC 252. (Fall)

258. Parallel and Distributed Systems. This course focuses on the principles of parallel and distributed systems, and the associated implementation and performance issues. Programming interfaces to parallel and distributed computing, memory management techniques, and parallel program optimization. Interprocess communication, synchronization, and consistency models. Fault tolerance and reliability. Distributed process management, multiprocessor architectures, and the interaction of the compiler, run-time, and hardware architecture. Prerequisites: CSC 254, 256, and consent of instructor. (Fall or Spring; may not be offered every year)

260. Topics in Natural Dialog Systems. This course examines recent research in computational linguistics and artificial intelligence on natural language dialog systems. Students take turns leading the discussion of current research papers. Undergraduates taking the course for credit also are required to prepare a written review of one of the papers. Prerequisites: CSC 244 and CSC 247. (Fall or Spring)

280. Computer Models and Limitations. This course studies fundamental computer models and their computational limitations. Finite-state machines and pumping lemmas, the Chomsky hierarchy, Turing machines and algorithmic universality, noncomputability and undecidability, tradeoffs between power, and formal tractability. Prerequisite: CSC 173. (Spring)

281. Cryptography. Introduction to classical and modern cryptography. Covers classical cryptography, cryptographic foundations, private key cryptography, public key cryptography, and their applications. Prerequisites: MTH 150 or MTH 162 (or equivalent); CSC 171 (or equivalent). (Fall or Spring: may not be taught every year)

282. Design and Analysis of Efficient Algorithms. How does one design programs and ascertain their efficiency? Divide-and-conquer techniques, string processing, graph algorithms, mathematical algorithms. Advanced data structures such as balanced tree schemes. Introduction to NP-completeness and intractable combinatorial search, optimization, and decision problems. Prerequisites: CSC 172. (Fall)

284. Advanced Algorithms. Advanced study of design and analysis of algorithms. Topics typically include growth of functions; recurrences; probabilistic analysis and randomized algorithms; maximum flow; sorting networks; expander graphs; matrix operations; linear programming; discrete Fourier transform; number-theoretic algorithms;
string matching; computational geometry;
NP-completeness; approximation algorithms. Prerequisite: CSC 282. (Spring)

286. Computational Complexity. This course continues the development of the theory of computing begun in CSC 280. Topics include the formal characterization of computational hardness; one-way functions and cryptography; the complexity hierarchy; and information theory. Prerequisite: CSC 280. (Fall)

287. Randomized, Parallel, and Other Advanced Modes of Computation. Probabilistic algorithms and complexity classes. Algorithmic randomness. Circuit complexity. Resource tradeoffs. Computation trees and counting-based computation. Prerequisite: CSC 286. (Spring or Fall; may not be offered every year)

290. Topics in Computer Science. Rotating topics in computer science that require prior computer science experience. May be repeated for credit for different topics. Recent offerings have included Human Computer Interaction, Collaborative Software Engineering, Introduction to Computer Security, Introduction to Database Systems, and Computational Photography and Video. Prerequisite: varies with topic. (Fall and/or Spring)

SPECIAL COURSES

390. Supervised Teaching.

391. Independent Study. Special work arranged individually with a faculty member.

391H. Honors Independent Study. Special work arranged individually with a faculty member for completion of the honors research B.S.

393. Senior Project. A one-semester senior project for computer science majors. Each project is arranged individually with a faculty advisor.

393H. Senior Project. A one-semester senior project for computer science majors completing the honors research B.S. Each pro-

ject is arranged individually with a faculty advisor.

394. Internship.

395. Research in Computer Science.

Special problems may be arranged for advanced students to do individual research. Requires consent of the department.

395H. Honors Thesis Writing. Usually the final course in an honors research program, this course gives credit for experimental and scholarly research, writing, revision, and the oral defense of a senior thesis.

ELECTRICAL AND COMPUTER ENGINEERING

David Blackstock, Ph.D. (Harvard) *Visiting Professor of Electrical and Computer Engineering*

Mark F. Bocko, Ph.D. (Rochester) *Professor of Electrical and Computer Engineering and of Physics; Chair of the Department*

Victor V. Derefinko, M.S. (Virginia) *Adjunct Professor of Electrical and Computer Engineering*

Philippe M. Fauchet, Ph.D. (Stanford) *Distinguished Professor of Electrical and Computer Engineering, Professor of Materials Science, of Biomedical Engineering, and of Optics; Senior Scientist in the Laboratory for Laser Energetics*

James R. Fienup, Ph.D. (Stanford) *Robert E. Hopkins Professor of Optics, Professor in the Center for Visual Science and of Electrical and Computer Engineering; Senior Scientist in the Laboratory for Laser Energetics*

Eby G. Friedman, Ph.D. (California, Irvine) *Distinguished Professor of Electrical and Computer Engineering*

Thomas Y. Hsiang, Ph.D. (Berkeley) *Professor of Electrical and Computer Engineering; Associate Dean of Undergraduate Studies in Engineering and Applied Sciences*

Thomas B. Jones, Ph.D. (M.I.T.) *Professor of Electrical and Computer Engineering*

Kevin J. Parker, Ph.D. (M.I.T.) *William F. May Professor of Engineering and Professor of Electrical and Computer Engineering, of Biomedical Engineering, and of Imaging Sciences*

Roman Sobolewski, Ph.D. (Warsaw) *Professor of Electrical and Computer Engineering, of Materials Science, and of Physics; Senior Scientist in the Laboratory for Laser Energetics*

A. Murat Tekalp, Ph.D. (Rensselaer) *Adjunct Pro-fes-sor of Electrical and Computer Engineering*

Robert C. Waag, Ph.D. (Cornell) *Arthur Gould Yates Professor of Engineering, Professor of Electrical and Computer Engineering and of Imaging Sciences*

David Albonesi, Ph.D. (Massachusetts) *Adjunct Associate Professor of Electrical and Computer Engineering*

Wendi B. Heinzelman, Ph.D. (M.I.T.) *Associate Professor of Electrical and Computer Engineering and of Computer Science; Dean of Graduate Studies*

Michael Huang, Ph.D. (Illinois at Urbana/Champaign) *Associate Professor of Electrical and Computer Engineering and of Computer Science*

Jack G. Mottley, Ph.D. (Washington, St. Louis) *Associate Professor of Electrical and Computer Engineering and of Biomedical Engineering*

Gaurav Sharma, Ph.D. (North Carolina State) *Associate Professor of Electrical and Computer Engineering; Director, Center for Electronic Imaging Systems*

Paul Ampadu, Ph.D. (Cornell) *Assistant Professor of Electrical and Computer Engineering*

Lisa DeLouise, Ph.D. (Pennsylvania State University) *Assistant Professor of Dermatology, of Biomedical Engineering, and of Electrical and Computer Engineering.*

Hanan Dery, Ph.D. (Technion-Israel Institute of Technology) *Assistant Professor of Electrical and Computer Engineering*

Marvin Doyley, Ph.D. (University of London) *Assistant Professor of Electrical and Computer Engineering*

Zeljko Ignjatovic, Ph.D. (Rochester) *Assistant Professor of Electrical and Computer Engineering*

Engin Ipek, Ph.D. (Cornell) *Assistant Professor of Computer Science and of Electrical and Computer Engineering*

Alireza Seyedi, Ph.D. (Rensselaer Polytechnic Institute) *James P. Wilmot Distinguished Assistant Professor and Assistant Professor (Research) of Electrical and Computer Engineering*

Azadeh Vosoughi, Ph.D. (Cornell) *James P. Wilmot Distinguished Assistant Professor and Assistant Professor of Electrical and Computer Engineering*

Hui Wu, Ph.D. (California Institute of Technology)*Assistant Professor of Electrical and Computer Engineering*

David Headlam, Ph.D.(Michigan) *Professor of Music Theory, ESM; Affiliated Faculty in Electrical and Computer Engineering*

Edwin L. Carstensen Ph.D. (Pennsylvania) *Arthur Gould Yates Professor Emeritus of Engineering and Senior Scientist in Electrical and Computer Engineering*

JOINT APPOINTMENTS

Sandhya Dwarkadas, Ph.D. (Rice) *Professor of Computer Science and of Electrical and Computer Engineering*
Diane Dalecki, Ph.D. (Rochester) *Associate Professor of Biomedical Engineering and of Electrical and Computer Engineering; Director, Rochester Center for Biomedical Ultrasound*
Mathews Jacob, Ph.D. (Lausanne) *Assistant Professor of Imaging Sciences, of Biomedical Engineering, and of Electrical and Computer Engineering*
Stephen McAleavy, Ph.D. (Rochester) *Assistant Professor of Biomedical Engineering and of Electrical and Computer Engineering*

Much of the modern technological landscape has been shaped by electrical and computer engineers. Technologies such as the Internet, television, wireless phones, and digital audio make possible many new and productive activities. To turn ideas into reality, electrical and computer engineers need to understand the physical principles underlying electrical phenomena and the mathematics used to describe the behavior of electrical systems. Furthermore, they need to learn and to practice the principles of design and problem solving so that they can apply their knowledge effectively. Finally, they need to keep themselves informed of new developments in science and technology in order to meet tomorrow's challenges.

UNDERGRADUATE PROGRAMS

Our mission is to provide our students with the knowledge and skills that will enable them to build productive careers in the field of electrical and computer engineering. We teach our students the principles and good practices of modern basic and applied electrical and computer engineering. We train them to solve problems systematically, yet to think creatively, and we develop in them an awareness of the role of engineering in modern society.

The electrical and computer engineering (ECE) curriculum at the University of Rochester encourages students to pursue individual interests and goals with respect to both general educational and professional training. The curriculum emphasizes fundamentals that prepare a student for lifelong learning to meet the career challenges presented by rapidly changing technologies. The electrical and computer engineering department's nationally recognized faculty and laboratories, combined with an outstanding faculty-to-student ratio, create the ideal environment for training the twenty-first-century engineer.

Curricular flexibility in the third and fourth years permits specialization in signals and communications, solid state devices and microelectronics, computer engineering, and electromagnetic fields, waves, and devices. A premedical program is available for students interested in the combination of engineering and medicine. In addition, students interested in law or management may take preparatory courses in these subjects as electives.

The curriculum is based on a set of lower- and upper-division core courses required of all students and emphasizing the application of mathematical, computer, and physical concepts to the solution of engineering problems. Nearly all undergraduate ECE courses include laboratory work intended to provide students with extensive design experience.

By the senior year all students select an area of concentration, which specifies upper-division courses and a senior design project. The senior design project is carried out under the supervision of an electrical and computer engineering faculty member. Undergraduate students are also encouraged to participate in active research programs under the direction of University faculty by enrolling in special project courses (ECE 396).

A distinctive feature of the curriculum is the removal of artificial boundaries between undergraduate and graduate courses. Undergraduates may take basic graduate courses in addition to advanced undergraduate electives. This feature facilitates preparation for graduate study in electrical and computer engineering in related areas such as computer science.

Our objectives are to

- Develop within our graduates a basic foundation of knowledge in six fundamental areas of electrical and computer engineering (circuits and systems, electromagnetics, microelectronics, digital systems, computer architecture, signals and communications) with additional depth and design experience in at least one area.
- Develop in our students the proficiency in engineering analysis and synthesis needed for the professional practice of electrical and computer engineering.
- Help our students to develop the skills necessary to function effectively on an engineering team.
- Develop within our graduates the ability to communicate effectively with the technical community and the general public.
- Instill in our graduates an appreciation of and enthusiasm for research, creativity, and lifelong inquiry.
- Foster within our graduates an appreciation for the need to maintain the highest ethical standards in their professional lives.
- Provide our students with the breadth to pursue opportunities in nontraditional fields within or outside electrical and computer engineering.

Below is the standard four-year 128 credit-hour electrical and computer engineering curriculum, showing the University requirements, electrical and computer engineering core courses, and other departmental requirements. The order of completion of upper-division requirements is primarily the decision of the student and his or her advisor, although attention must be given early in the program planning process to prerequisites.

STANDARD FOUR-YEAR PROGRAM

First Year

ECE 112	ECE 114	
ECE 101[1] or ECE 140[1]	MTH 162[2]	
MTH 161[2]	PHY 121[3]	
WRT 105 (Primary Writing)		
Elective (hum. or social science)[4]		

Second Year

ECE 111	ECE 113	
MTH 165[2]	MTH 164[2]	
PHY 122[3]	PHY 123 or	Elective (hum. or natural science[3] social science)[4]

Third and Fourth Years

ECE 221	ECE 222, 216
ECE 241	ECE 242
ECE 230	ECE 200

Plus the following:

- ECE 270 or MTH 201, Introduction to Probability (taken prior to ECE 242)
- 1 ECE advanced elective course
- 1 ECE capstone design course
- ECE 399 (2 credits), Social and Ethical Aspects of Engineering
- ECE 398 (2 credits), Engineering Design Seminar
- Free electives to complete the balance of 128 credit hours.

A total of 12 ECE courses, as well as an ECE capstone design course plus the two seminar courses, ECE 398 and 399, are required for graduation. ECE 399 should be taken in the junior year and ECE 398 must be satisfactorily completed, usually in the fall term of the senior year, prior to undertaking the capstone design course.

The faculty of the Department of Electrical and Computer Engineering recognize achievement among our graduates by noting those who graduate with distinction based upon their average grades in their core ECE courses. In particular, students who have a GPA of 3.90 or higher in the core ECE courses will receive their degrees with Highest Distinction; those with GPAs between 3.70 and 3.89 will be noted to have achieved High Distinction; and those who have GPAs between 3.40 and 3.69 will receive Distinction.

ACCREDITATION

The ECE program meets the professional accreditation requirements established by the Accreditation Board of Engineering and Technology (ABET) and the Institute of Electrical and Electronics Engineers (IEEE).

Upon completion of the B.S. ECE program, our graduates are eligible to take the Fundamentals of Engineering Examination, which is the first step in earning professional registration.

ADMISSION

To be considered for admission to the concentration in electrical and computer engineering, students complete the following: the required first- and second-year courses (ECE 111, 112, 113, and 114) or equivalent, with a minimum grade-point average of 2.3; complete MTH 161, 162, 165, 164, or equivalent mathematics sequence; and PHY 121, 122, 123 (or other natural science course in place of PHY 123). Students must also have completed the University primary writing requirement (WRT 105). In addition, a minimum grade-point average of 2.0 must be achieved overall. The four required ECE courses, ECE 111, 112, 113, and 114, must be taken at the University of Rochester. An exception is made for students who have been admitted directly into the program via the transfer admission process. Only courses taken at Rochester are used in calculating the grade-point average.

Any student who wishes to major in electrical and computer engineering is required to file a Concentration Approval Form approved by his or her faculty advisor, usually during the fourth semester of study. For graduation, electrical and computer engineering majors are required to achieve a cumulative grade-point average of at least 2.0 in the 12 courses constituting the ECE undergraduate core.

Students who desire a more flexible program and who elect to forego an ABET-accredited degree may plan a degree program leading to a B.A. in engineering science (page 134) or plan a degree program under the Interdepartmental Programs (page 158).

B.S.-M.S. PROGRAM IN
ELECTRICAL AND COMPUTER ENGINEERING

Electrical and computer engineering juniors are encouraged to consider the special five-year program outlined below. Students are accepted into this program in the spring of their junior year and can begin graduate-level independent work in their senior year. At the end of the five-year program, both a B.S. and an M.S. in electrical and computer engineering are awarded. Students may pursue either a Plan A (with thesis) or a Plan B (with a comprehensive examination) M.S. degree program.

To be accepted, students must have a good academic record and must have completed the lower-division core courses and at least two of the upper-division cores courses by the end of their junior year. Students admitted to the program may also be considered for financial aid in the fifth year.

ELECTRICAL AND COMPUTER ENGINEERING MINOR

The formal requirements for the minor in electrical and computer engineering are five ECE courses. There are no specific course requirements, although a focused program of study should be planned with an advisor in the electrical and computer engineering department. Students should contact the ECE department office to arrange to meet with an advisor.

UPPER-LEVEL WRITING REQUIREMENT

ECE 111, 112, 113, and 399 fulfill the College upper-level writing requirements.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

101. Introduction to Electrical and Computer Engineering. Credit—2 hours. This course meets for 2.5 hours once a week. Project-based course gives an overview of the principal areas of electrical and computer engineering and introduces some tools and practices of engineering. Projects include assembly of electronic devices and computer modeling and simulation. (Fall)

111. Introduction to Signals and Circuits. Analysis techniques for DC and AC circuits. Concurrent registration in MTH 163 or 165 and PHY 122. (Fall)

112. Logic Design. Two-level and multi-level combinational logic minimization. Programmable logic. Sequential logic design. Finite state machines optimization and implementation. Rapid prototyping. Laboratory: Field Programmable Gate Array (FPGA) designs. Prerequisites: one semester of college mathematics. Ability to operate computers. (Spring)

113. Circuits and Signals. Signal representation with applications to circuits: AC circuits and phasors, complex frequency, amplifiers and filters, resonance, two-port networks, Fourier series, Fourier transforms, Laplace transforms. Prerequisites: ECE 111, MTH 163, or MTH 165; concurrent with MTH 164.
(Spring)

114. Introduction to Computers and Programming. Introduction to principles of well-structured and efficient computer programming in the C++ language. Topics include development and analysis of algorithms, debugging strategies, program verification, computer hardware, basics of the C/C++ programming language and techniques for developing computer programs using this language. (Spring)

140. Introduction to Digital Music. Vibrations and musical sound from strings and pipes. Digitization of sound, digital recording, digital storage. Spectral analysis, digital filtering. Musical sound synthesis: additive synthesis, subtractive synthesis, FM, physical modeling. Musical Instrument Digital Interface (MIDI) and computer-based interactive music. Laboratory. (Fall, taught alternate years with ECE 240)

200/400. Computer Organization. Instruction set principles; processor design, pipelining, data and control hazards; datapath and computer arithmetic; memory systems; I/O and peripheral devices; internetworking. Students learn the challenges, opportunities, and tradeoffs involved in modern microprocessor design. Assignments and labs involve processor and memory subsystem design using hardware description languages (HDL). Prerequisite: ECE 114 or CSC 171. (Spring)

201. Advanced Computer Architecture. Instruction set architectures. Advanced pipelining techniques. Instruction level parallelism. Memory hierarchy design. Multiprocessing. Storage systems. Interconnection network. Prerequisite: ECE 200. (Fall)

210. Circuits for Scientists and Engineers. Intended for physical scientists and (non-electrical) engineers. Electrical concepts are developed based on modern needs and techniques: current, voltage, components, microcontrollers, sources, operational amplifiers, analysis techniques, first- and second-order circuits, timing with microcontrollers, sinusoids and AC, controlling motors, and power circuits. Laboratory. Prerequisites: MTH 163 or 165, PHY 122. (Spring)

216. Microprocessors and Data Conversion. Overview of the architecture of microprocessor and embedded microcontroller systems. Including the central processing unit, memory, bus structures (internal and external such as PCI, USB, CAN, GPIB), I/O in-

cluding programmable peripheral interface controllers. Timer/counters, analog-to-digital converters, digital-to-analog converters, multiplexers, and interrupt structures. The focus is on the development of applications written in assembly language and in a high-level programming language such as C or C++. Efficient methods for designing and developing programs for embedded microcomputer systems are covered with an emphasis on processing data from peripheral devices in real-time applications. Serial and parallel I/O, interrupt applications, use of A/D and D/A converters, and applications of timer/counters are studied, with special attention given to interfacing the microcontroller to the analog world. Labora-tory. Prerequisites: ECE 112, 113, 114 or permission of instructor. (Spring)

221. Electronic Devices and Circuits. Introduction to the physics and operation of semiconductor devices and to the design and analysis of basic electronic circuits. Semiconductor transport properties, p-n junction diodes, and diode circuits. Bipolar junction transistors. Single- and multistage BJT amplifiers. Differential amplifiers. Small-signal analysis, bias design, time and frequency response of BJT circuits. Laboratory. Prerequisite: ECE 113. (Fall)

222. Integrated Circuits Design and Analysis. An introduction to the design and analysis of digital and analog integrated circuits. Technologies, such as NMOS, CMOS, GaAs, Bipolar, and BiCMOS are discussed. Semiconductor processing and device models are developed and applied. Specific circuit structures are analyzed and their time/frequency responses evaluated and interpreted. The course includes a laboratory that integrates both experimental design and analysis and computer simulation. Problem sets and assigned reading are handed out regularly. Prerequisite: ECE 221. (Spring)

223/423. Semiconductor Devices. Review of modern solid-state devices, their fabrication and principles of operation. Solid-state physics fundamentals, free electrons, band theory, transport properties of semiconductors, tunneling. Physics of thin films. Silicon integrated circuit processing technology. Microwave and ultrafast devices. Same as MSC 426. Prerequisites: ECE 221, 230, PHY 123 or permission of instructor. (Fall)

230. Electromagnetic Waves. TEM waves in transmission line structures, transient and steady-state solutions. Applications in digital circuits, RF equipment, and optical communication networks. Maxwell's equations and wave equations in homogeneous media. Plane waves in homogenous loss-less and low-loss media. Linear and circular polarization. Wave propagation in lossy/conducting media and skin effect. Dipole radiation, transceiver and receiver antennas, and antenna arrays. Satellite communications and fiber optical communications. Quantum communicatons. Laboratory. Prerequisites: MTH 163, 164, PHY 122, ECE 113. (Fall)

234/434. Microelectromechanical Systems. Static and quasistatic field for micro-electromechanical transducers. Lumped parameter electromechanics and two-port descriptions. Reciprocity, sensitivity, and noise considerations. Review of fabrication technologies. Case studies of practical micro-actuators and sensor elements. Laboratory. Prerequisites: MTH 163, 164, PHY 122. (Spring)

235/435. Introduction to Optoelectronics. Introduction to fundamentals of electromagnetic wave propagation in materials, waveguides and fibers, generation, modulation and detection of light using semiconductor devices, and elements of optocommunication systems. Prerequisites: ECE 230, 221, equivalent/permission of instructor. (Fall)

240. Musical Sound: Science and Synthesis. Engineering and physical science concepts underlying musical sound analysis and synthesis. Oscillation, waves, impedance, musical instrument sound production, digital representation of musical signals, spectra, digital filtering, subtractive and additive music synthesis, FM synthesis, sampling, physical modeling. Prerequisite: ECE 241 or permission of instructor. (Fall, taught alternate years with ECE 140)

241. Signals. Introduction to continuous and discrete time signal theory and analysis of linear time-invariant systems. Signal representations, convolution, Fourier analysis, filtering of continuous and discrete time signals, Laplace and Z transforms. Laboratory. Prerequisites: MTH 164, 165, and ECE 113. (Fall)

242. Communication Systems. Communication systems overview. Analog signal transmission and reception, amplitude and frequency modulation: bandwith, power, and complexity trade-offs, elements of random processes. Noise in communication systems, performance of analog communication systems in the presence of noise. Digital communication system overview, sampling and quantization, digital baseband transmisson over additive white Gaussian noise channels. Optimum receiver principles, baseband binary PAM and matched filter receiver, geometric signal representation. Introductory information theory. Laboratory. Prerequisite: ECE 241, 270 or MTH 201. (Spring)

244. Digital Communications. Digital communication system elements, characterization and representation of communication signals and systems. Digital transmission, binary and M-ary modulation schemes, demodulation and detection, coherent and incoherent demodulators, error performance. Channel capacity, mutual information, simple discrete channels and the AWGN channel. Basics of channel coding and error correction codes. Prerequisites: ECE 242 and 440 or permission of instructor. (Fall)

245/445. Wireless Communications. This course teaches the underlying concepts behind traditional cellular radio and wireless data networks (e.g., channel coding, medium-access) as well as design trade-offs among RF bandwidth, transmitter and receiver power and cost, and system performance. This course provides an in-depth look at modern cellular systems, wireless local area and personal area networks, ad-hoc data networks, and sensor networks. Topics include medium access control, routing, flow control, and cross-layer architectures. Issues such as quality of service (QoS), energy conservation, reliability, and mobility management are discussed. Students are required to complete a semester-long research project related to the theme of this course. Prerequisites: ECE

241, 242. (Spring)

246/446. Digital Signal Processing. Course begins with a review of discrete-time signals and systems. Following this, the course covers topics related to the analysis and design of discrete-time signals and systems, including: difference equations, discrete-time filtering, z-transforms, A/D and D/A conversions, multirate signal processing, FIR and IIR filter design, the Discrete Fourier Transform (DFT), circular convolution, Fast Fourier Transform (FFT) algorithms, windowing, and classical spectral analysis. Laboratory. Prerequisite: ECE 241. (Fall)

261/461. Introduction to VLSI. Issues in digital integrated circuit design. The devices. CMOS inverter. Combinational logic gates in CMOS. Designing sequential logic circuits. Designing arithmetic building blocks. Timing issues in digital circuits. Memories and array structures. Design verification and testing. Design projects using computer-aided design tools: SPICE, MAGIC, IRSIUM, OCTTOOLS. Prerequisites: ECE 112, 221. (Fall)

262/462. Advanced CMOS VLSI Design. Review of CMOS subsystem design. Team project on complex digital systems, such as a simple microprocessor, a self-timed multiplier, or a digital filter. Project design requirements include architectural design, logic and timing verification, layout design, and test pattern generation. The resulting VLSI chips may be fabricated. Prerequisites: ECE 261 or 222. (Spring)

266. RF and Microwave Integrated Circuits. This course involves the analysis and design of radio-frequency (RF) integrated circuits at the transistor level. Course begins with an introduction to radio architectures and specifications, followed by reviews of device physics and transmission line theory. After discussion of RLC networks, high-frequency amplifiers are studied, followed by wideband amplifiers. Then the important issue of noise with the design example of low-noise amplifiers (LNA) is examined. Nonlinear circuits are studied next with the example of mixers, followed by oscillators and the important subject of phase noise. Phase-locked loops and frequency synthesizers are then discussed. A study of RF power amplifiers follows, and the course concludes with an overview of transceivers. The course emphasizes the development of both circuit design intuition and analytical skills. There are weekly design labs and a term project using EDA tools. Prerequisites: ECE 222, 230 or equivalent. Permission of instructor. (Fall, alternate years)

269/469. High-Speed Integrated Electronics. An introduction course for state-of-the-art integrated electronics in high-speed and wideband applications, which spans the fields of wireless communications, computing, fiber optics, and instrumentation. The course begins with an overview of high-speed semiconductor technologies (CMOS, SiGe, SOI, GaAs, InP, etc.) and devices (MOSFET, MESFET, HEMT, HBT, and tunneling diodes), followed by discussion of device characterization and technology optimization for circuit performance. The second part of the course focuses on the design of wideband and high-power amplifiers, which includes discussions on feedback, impedance matching, distributed amplifiers, power combining, and switching power amplifiers. The third part of the course involves the design of high-speed phase-locked and delay-locked loops (PLL and DLL). A review of PLL basics and discussion of its building blocks (VCO, frequency divider, phase detector, and loop filter) follows. Two important applications, frequency synthesis and clock recovery, serve as examples for discussing and analyzing loop performance, in particular phase noise, jitter, and dynamic performance, and how to improve them. Each part of the course includes related simulation methods and measurement techniques. The course also emphasizes the understanding of basic circuit operation and the development of circuit-design intuition. Prerequisites: ECE 222 and 230. (Fall)

270. Introduction to Probability. The topics covered in the course are basic concepts of probability theory, combinatorial analysis, discrete and continuous random variables (RVs), pairs of RVs vector random variables, estimation of an RV, Central Limit Theorem, and an introduction to random processes. (Fall)

349. Senior Design Project. Senior design course. Prior faculty approval required for design project proposal. Prerequisites: all courses designated for the concentration option. All courses in the first seven semesters of this program. (Spring)

398. Design Seminar. Credit—2 hours. Students majoring in electrical and computer engineering take this course to prepare the proposal for the Capstone Design Project to be carried out in the spring semester. Students and instructor consult with design project supervisors in various areas to devise a plan. Proposal might include definition of project requirements and product specifications, clarification and verification of end user requirements, subsystem definition and interfaces, generation of project and testing plans, reliability analysis, product safety, compliance issues, manufacturability, cost, and documentation. Prerequisites: ECE 111, 112, 113, 114. Required of all electrical and computer engineering students. Must have at least junior standing and be taking the first course in a concentration sequence. (Fall of junior year)

399. Junior Seminar. Credit—2 hours. Study of ethical, social, economic, and safety considerations that arise in engineering practice by discussion of appropriate novels, movies, essays, videos, and other materials. Presentations by outside speakers. Required of all electrical and computer engineering students. (Spring)

The following graduate courses are open to advanced undergraduates with permission of the instructor.

401. Advanced Computer Architecture.
404. High Performance Microprocessor-Based System.
420. Introduction to Solid State.
423. Semiconductor Devices.
425. Superconductivity and the Josephson Effect.

431. Microwave and Wireless.
432. Fundamentals of Acoustical Waves.
433. Musical Acoustics.
434. Microelectromechanical Systems.
435. Introduction to Optoelectronics.
440. Introduction to Random Processes.
441. Detection and Estimation Theory.
444. Digital Communications.
445. Wireless Communications.
446. Digital Signal Processing.
447. Digital Image Processing.
450. Information Theory.
452. Medical Imaging—Theory and Implementation.
461. Introduction to VLSI.
462. Advanced CMOS VLSI Design.
463. VLSI Error Control Systems.
464. Fundamentals of VLSI Testing.
465. Performance Issues in VLSI/IC.
466. RF and Microwave Integrated Circuits.
467. Advanced Analog Integrated Circuit Design.
468. Advanced Analog CMOS Integrated Circuit Design II.
469. High-Speed Integrated Electronics.
471. Computational Music.
472. Audio Signal Processing for Ana.
492B. Special Topics: Digital Signal Processing.
492H. Special Topics: Macroscopic Quantum Phenomena for Electrical Qubits.
492I. Special Topics: Musical Instrument: Physical Modeling.
492J. Special Topics: High-Frequency and High-Speed Integrated Circuits and Systems.
492L. Special Topics: VLSI Signal Processing.
492N. Special Topics in Imaging Processing.
580. Nano-Electro-Opto-Bio.
585. Special Topics: Physics of Advanced Optoelectronic and Electronic Devices.
589. Preparing for Academic Careers in Engineering and Science.

MECHANICAL ENGINEERING

Riccardo Betti, Ph.D. (M.I.T.) *Professor of Mechanical Engineering and of Physics, and Senior Scientist in the Laboratory for Laser Energetics*
*Stephen J. Burns, Ph.D. (Cornell) *Professor of Mechanical Engineering and of Materials Science*
Robert Clark, Ph.D. (Virginia Polytechnic Institute and State University) *Professor of Mechanical Engineering and of Biomedicial Engineering; Dean of the Edmund A. Hajim School of Engineering and Applied Sciences*
Paul D. Funkenbusch, Ph.D. (Michigan Tech.) *Professor of Mechanical Engineering and of Materials Science*
*Roger F. Gans, Ph.D. (California, Los Angeles) *Professor of Mechanical Engineering*
*†Victor L. Genberg, Ph.D. (Case Western Reserve)*Professor of Mechanical Engineering*
Sheryl M. Gracewski, Ph.D. (California, Berkeley) *Professor of Mechanical Engineering and of Biomedical Engineering*
John C. Lambropoulos, Ph.D. (Harvard) *Professor of Mechanical Engineering and of Materials Science, and Senior Scientist in the Laboratory for Laser Energetics; Director of Materials Science Program*
James C. M. Li, Ph.D. (Washington) *Albert Arendt Hopeman Professor of Mechanical Engineering and Professor of Materials*

Science

Robert L. McCrory, Jr., Ph.D. (M.I.T.) *Professor of Mechanical Engineering and of Physics and Astronomy, and Senior Scientist in the Laboratory for Laser Energetics; Vice Provost and Director and CEO of the Laboratory for Laser Energetics*

David D. Meyerhofer, Ph.D. (Princeton) *Professor of Mechanical Engineering, and of Physics, and Senior Scientist in the Laboratory for Laser Energetics; Assistant Director of Laboratory for Laser Energetics*

Renato Perucchio, Ph.D. (Cornell) *Professor of Mechanical Engineering and of Biomedical Engineering and Associate Professor of Pediatrics*

*David J. Quesnel, Ph.D. (Northwestern) *Professor of Mechanical Engineering and of Materials Science*

*John H. Thomas, Ph.D. (Purdue) *Professor of Mechanical and Aerospace Sciences and of Astronomy*

Richard E. Waugh, Ph.D. (Duke) *Professor of Pharmacology and Physiology, of Biochemistry and Biophysics, of Mechanical Engineering, and of Biomedical Engineering*

Amy Lerner, Ph.D. (Michigan) *Associate Professor of Biomedical Engineering and of Mechanical Engineering*

†Ahmet Becene, Ph.D. (Rochester) *Adjunct Assistant Professor of Mechanical Engineering*

Valeri Goncharov, Ph.D. (Rochester) *Adjunct Assistant Professor of Mechanical Engineering and Scientist in the Laboratory for Laser Energetics*

Andrei Maximov, Ph.D. (Lebedev, Russia) *Adjunct Assistant Professor of Mechanical Engineering and Scientist in the Laboratory for Laser Energetics*

Chuang Ren, Ph.D. (Wisconsin-Madison) *Assistant Professor of Mechanical Engineering and of Physics*

Yiquan Wu, Ph.D. (Imperial College, UK) *Assistant Professor (Research) of Mechanical Engineering*

†Craig Ronald, M.S. (Rochester) *Associate Lecturer in Mechanical Engineering*

†Justin Gao, Ph.D. (Northwestern) *Lecturer in Mechanical Engineering*

†Christopher Muir, Ph.D. (Lehigh) *Lecturer in Mechanical Engineering*

†Gordon Verdin, M.S. (Toronto, Canada) *Lecturer in Mechanical Engineering*

*Alfred Clark, Jr., Ph.D. (M.I.T.) *Professor Emeritus of Mechanical Engineering, of Biomedical Engineering, and of Mathematics*

Leonard M. Goldman, Ph.D. (Rochester) *Professor Emeritus of Mechanical Engineering*

*Albert Simon, Ph.D. (Rochester) *Professor Emeritus of Mechanical Engineering and of Physics and Senior Scientist in the Laboratory for Laser Energetics*

The Department of Mechanical Engineering offers an undergraduate program leading to the degree of bachelor of science in mechanical engineering and a program leading to the degree of bachelor of science in geomechanics. The program in geomechanics is described on page 158.

The following mission statement and the goals of the program were approved in January 2003 as part of our continuing review. The faculty view both the mission statement and goals of our program as results of continual evaluation and assessment. Updated, current versions may be found in the Web pages of the Department of Mechanical Engineering (www.me.rochester.edu).

MISSION OF THE PROGRAM IN MECHANICAL ENGINEERING

The mission of the Bachelor of Science program in mechanical engineering at the University of Rochester is to educate able, creative, responsible engineers capable of assuming leadership roles in their profession. The department offers a rigorous academic program designed to prepare students for engineering practice, graduate study, and a lifetime of continued learning. The curriculum is based on a firm foundation of basic science, applied mathematics, and engineering sciences, and includes significant experience in experimental work and in the analysis, design, and development of mechanical and thermal systems. The program aims to enhance the leadership and communication skills needed to excel in professional life and to promote an understanding of the broad social and economic impacts of engineering.

GOALS OF THE PROGRAM IN MECHANICAL ENGINEERING

1. To produce competent mechanical engineers employed in a wide variety of technical areas in the local, national, or international engineering job markets.

2. To prepare graduates who realize the value of continuing their education with a view toward careers in industry, research, business, or academia.

3. To educate articulate engineers who can see their engineering work in a larger social-political context for today's complex, global, international responsibilities.

PROGRAM IN MECHANICAL ENGINEERING

Mechanical engineers are among the most versatile, flexible, and broadly based engineers in the profession. Our students acquire knowledge in fields of energy, material properties, fluid mechanics, solid mechanics, dynamics, laboratory technique, design meth-

odology, and system analysis. Our graduates apply their skills in jobs requiring engineering design, development, manufacturing, research, and resource management.

The University of Rochester has offered an undergraduate degree in mechanical engineering (ME) for over 100 years. This program provides effective preparation for students who enter industry immediately upon graduation as well as excellent background for graduate study in engineering and other fields.

The curriculum provides a balance of courses in the humanities and social sciences, physics, applied mathematics, and basic engineering. Emphasis is placed on the underlying fundamentals in the required engineering course-work, enabling graduates to adapt throughout their careers to rapid advances in science and technology. Training in the design process gradually supplements the analytical content of the courses as the undergraduate progresses. Our laboratory and design courses emphasize team projects. Formal oral and written presentations are key elements of these projects. A required senior year sequence in design acts as a capstone course in this process.

Many undergraduates in the department assist faculty members in research projects during the academic year and the summer. This work can lead to publication in the professional archival literature. It is encouraged for those students so inclined. Recent projects involving undergraduates include experiments in controlled nuclear fusion using high-powered lasers, use of the electron microscope and testing machines to study engineering materials, mechanics of soldered and welded joints, studies in human microcirculation, experimental studies in optics manufacturing, modeling crystal growth, and experiments on nonlinear dynamical systems.

CURRICULUM

The B.S. degree requires 130 credit hours, -divided among science, mathematics, engineering, humanities, and social sciences. The required engineering courses are shown below in the four-year degree program in mechanical engineering. There is an introductory course in engineering graphics; a sequence in mechanics, ME 120, 121, 226, 213; a sequence in energy and fluids, ME 123, 223, 225, 251; a materials course, ME 280; a laboratory in materials and solids, ME 242; and a laboratory in fluid dynamics and thermal systems, ME 241. Computational skills are absolutely necessary for modern engineering, and we distribute such training in many of the required curriculum courses, as well as in a junior-level course in modern numerical methods, ME 211. All these are capped by the senior advanced design sequence, ME 204, 205. Students are required to take an introductory course in electrical circuits.

For admission to the mechanical engineering major, the student must have completed the first two years as listed in the four-year degree program below. In addition, the student must have attained a grade-point average of 2.0 or better in all mechanical engineering courses taken, and an overall grade-point average of 2.0 or better.

For graduation, concentrators in the department must obtain a cumulative average of 2.0 or higher for all required mechanical engineering courses, and an overall grade-point average of 2.0 or higher.

The faculty of the Department of Mechanical Engineering recognize achievement among our graduates by noting those who graduate with distinction based upon their average grades in their core ME courses. In particular, students who have a GPA of 3.85 or higher in the core ME courses will receive their degrees with Highest Distinction; those with GPA's between 3.60 and 3.84 will be noted to have achieved High Distinction; and those who have a GPA between 3.25 and 3.59 will receive Distinction.

Students are encouraged to join and be active in the student chapter of the American Society of Mechanical Engineers (ASME), the professional society for mechanical engineers. In addition, seniors are encouraged to take Part A of the New York State Professional Engineering License examination.

ELECTIVES

Our program has one required technical elective and one required natural science elective. There are also three free electives, in addition to the five required distribution elec-tives in the humanities and social sciences. These may be used to make it easier to minor in an approved field in the humanities or social sciences, acquire a language, take graduate courses in engineering, acquire some business/management skills, or generally broaden the undergraduate experience.

DISTRIBUTION REQUIREMENTS

In addition to the required primary writing course, students must take four courses in the humanities or social sciences. Three of these courses must constitute a cluster. The Accreditation Board for Engineering and Technology (ABET) specifies that distribution requirements meet certain conditions. The first condition is that the set of courses taken must exhibit some depth, and cannot all be at the introductory level. This condition is normally satisfied by a cluster. The second condition is that courses dealing only with routine skills or exercises of personal craft are not suitable distribution requirements.

ACCREDITATION

Each student is assisted by a faculty advisor in planning a program of study. In making specific course selections, each student is required to satisfy not only the course requirements given below, but also the minimum professional accreditation requirements of

the Accreditation Board for Engineering and Technology. Faculty advisors should be consulted to be sure that all such requirements are met.

STANDARD FOUR-YEAR PROGRAM

Below is the standard four-year program for students who decide on a mechanical engineering major in their first year. The basic mechanics course ME 120 is offered every semester. This allows an alternative four-year program for students entering the mechanical engineering major in the sophomore year.

First Year	
MTH 161[1]	MTH 162[1]
CHM 131/151	PHY 121
Technical elective[2]	ME 120 Cluster course
WRT 105 (Primary Writing)	ME 110
Second Year	
MTH 163 or 165	MTH 164
PHY 122	Natural science
ME 121	ME 123
Cluster course	ME 226
Third Year	
ME 280	Circuits
ME 225	ME 241
ME 211	ME 223
Cluster course	Distribution elective
Fourth Year	
ME 204	ME 205
ME 242	ME 213
ME 251	Free elective
Free elective	Free elective

MINOR IN MECHANICAL ENGINEERING

A minor in mechanical engineering is available to give the nonmajor an opportunity to study some of the main ideas of modern engineering and acquire the skills necessary to implement them. The interested student should plan a focused program of study with any mechanical engineering faculty member.

The requirements for a minor in mechanical engineering are as follows:

- The student must attain passing grades in four ME courses at the 200 level or higher. The minimal acceptable GPA for these courses is 2.0.
- The student's program of study must include at least one of the following courses: ME 204, 205, 211, 241, 242, or 251.

In preparation for the upper-level mechanical engineering courses, a student would normally take two of the introductory courses ME 120, 121, 123, or their equivalents.

UPPER-LEVEL WRITING REQUIREMENT

Upper-level writing requirements are satisfied by the required writing components of the laboratory project and design courses required of all majors.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

104Q. Life's Structures: Mechanical Design in Nature and in the Technological World. Mechanical aspects of design in the context of two areas in which most students have a very good intuitive understanding: structures built and used by humankind over the centuries and human and animal bodies. We examine how Newtonian mechanics, material behavior, energy requirements, size, and dimensional considerations define the boundaries of mechanical design in nature and in human technology. On the side of technology, the course studies the evolution of masonry buildings, of bridges, and of other structures. In the case of biological design, topics include bones and the skeletal system, the heart and the circulatory system, muscles and soft tissues. Students work in teams on several design

projects, including written reports, model constructions, poster presentation.

106. Engineering in Antiquity. The application of engineering principles and technology to the design and performance of engineering structures from antiquity to the preindustrial world. The course combines three components: basic engineering principles (transfer of forces, momentum, and energy), study of primary texts (in translation), and examination of existing structures and designs. Primary texts include selections from Aristotle's *Mechanical Problems*, the *Ten Books on Architecture* by Vitruvius, Leonardo's *Notebooks*, Galileo's *Dialogues Concerning Two New Sciences*, and technical manuals from the eighteenth and early nineteenth centuries. Emphasis is on engineering design and its application. Term project. Prerequisites: none.

***110. Engineering Graphics.** Credit—2 hours. This course covers engineering drawing, and modeling using the computer-aided design software Pro/ENGINEER. Topics include orthographic projections, solid modeling, assemblies, and dimensioning. Students complete the course with a fundamental ability to create and understand solid modeling, and engineering drawings using state of the art PC CAD software. Lectures make use of a computer projection screen as well as 30 individual computers.

121. Engineering Mechanics II: Dynamics. Kinematics and dynamics of particles and rigid bodies. Forces and accelerations. Energy and momentum methods. Prerequisite: ME 120.

123. Thermodynamics. Concepts and definitions of energy, work, and heat. Properties of substances. Equations of state. First and second laws of thermodynamics. Entropy. Irreversibility and availability. Thermodynamic relations. Some power and refrigeration cycles. Prerequisites: MTH 162, PHY 121.

163. Applied Differential Equations. Linear first-order equations; separable first-order equations; direction fields and elementary numerical methods. General theory of linear second-order equations; equations with constant coefficients; inhomogeneous equations; detailed treatment of oscillators, including damping, forcing, and resonance. Introduction to nonlinear equations and phase plane methods. Extensive treatment of applications in engineering and science. Prerequisite: MTH 143 or 162.

164. Applied Vector Calculus and Linear Algebra. Review of vector algebra; scalar and vector fields; gradient, curl, and divergence; curves; surfaces; line integrals; surface integrals; Gauss' theorem; Stokes' theorem. Systems of linear equations; matrices and matrix algebra; matrix rank; vector spaces; eigenvalues and eigenvectors. Extensive treatment of applications in engineering and science. Prerequisite: MTH 143 or 162.

201. Applied Boundary-Value Problems. Formulation of partial differential equations for physical problems; Fourier series; separation of variables leading to Fourier series; Sturm-Liouville theory; eigenfunction expansions and separation of variables; Fourier transform; similarity methods; Fourier-Bessel expansions and separation of variables in cylindrical coordinates; Legendre polynomials and separation of variables in spherical coordinates. Equations dealt with in the course are the Laplace equation, the heat equation, the wave equation, and related equations. Applications are to such areas as heat conduction, fluid flow, diffusive mass transport, electrostatics, and acoustics. Cross-listed with MTH 281. Prerequisites: MTH 163/165, 164.

202. Applied Complex Variables. Complex numbers and the complex plane; analytic functions; elementary functions; complex integration; series expansions; residue theory; multi-valued functions; Laplace transform and complex inversion. Applications treated include the following: use of complex functions in oscillation theory; evaluation of real integrals by contour integration; numerical representation of functions by series; solution of ordinary differential equations by power series; solution of Laplace equation in two dimensions; solution of ordinary and partial differential equations by Laplace transform. Cross-listed with MTH 282. Prerequisites: MTH 163/165, 164.

203. Kinematics of Machinery. Geometrical kinematics. Elementary properties of plane motion with applications to linkages, cams, and gears. Analytical kinematics. Generalized coordinates, constraint equations, position and kinematic analysis of mechanisms. Numerical methods. Analytical dynamics of machines. Generalized forces, virtual work. Applications to reciprocating engines. Mechanism design project. Prerequisites: ME 120, 121.

204. Mechanical Design. The theory and application of structural mechanics to mechanical design. Topics include matrix structural analysis and finite element techniques. Students use the NASTRAN finite element program to solve a variety of design and analysis problems. The term project consists of a team competition to design, analyze, build, and test a lightweight structure. Prerequisite: ME 226 (ME 211 recommended).

205. Advanced Mechanical Design. This course follows ME 204 in the study of mechanical components and analysis models. There is an emphasis throughout on the use of the computer to obtain solutions and to achieve optimization. There is a semester-long team design project. Semester project is designed, assembled, and simulated using UGNX5 PLM package. Projects are presented at the end of the semester. Prerequisite: ME 204.

206. Building Engineering and Technology in Antiquity. The course examines the engineering and technological problems involved in the design, construction, maintenance, and collapse of major buildings (such as temples, theaters, baths, and cathedrals) and infrastructural systems (such as roads, bridges, aqueducts, and harbors) from antiquity to the preindustrial world. The course draws material from case studies of relevant monuments primarily from Classical Rome and Greece and the Middle Ages. Requirements: homework sets leading into term project and two midterm exams. The course is appropriate for students in the humanities and the social sciences as well as in engineering. Prerequisites: none.

207. Roman Structures: Building the Imperial City. This course examines the engineering and technology in Roman Imperial times as related to building design, construction, and maintenance of large-scale projects in the city of Rome. The course begins

with a mandatory study-on-location component in Italy in the summer. Topics include forces, materials, and structural design. ME 106, Engineering in Antiquity, is recommended but not required. The course is appropriate for students in the humanities and the social sciences as well as in engineering. Coursework includes homework assignments, midterm exam, and term project. Additional program fee for the study-on-location in Italy is required. Prerequisites: none.

211. Computational Methods in Mechanical Engineering. Introduction to Matlab, solution of polynomial and transcendental equations, solution of matrix equations, differentiation and integration, solution of ordinary differential equations, curve fitting (linear and polynomial regression). Applications. Prerequisites: MTH 163/165.

213. Mechanical Systems. Free and forced vibration in one, two, and many degree-of-freedom systems. Modeling of mechanical and electromechanical systems. Complex representation, damping, matrix methods, applications. State space feedback control of linear systems. Control project. Continuous systems; string and beam vibration. Prerequisites: ME 121, 226; MTH 163/165.

222. Introduction to Robust Design and Quality Engineering. Definition and pursuit of "quality" as a design criterion; ideas of Taguchi and others. The concept of robust design. Selection of the quality characteristics and experimental design to improve quality. Prerequisite: ME/MTH 164 or equivalent.

223. Heat Transfer. Modes of heat transfer; application of practical heat transfer devices. Steady-state and transient heat flow, external and internal forced flow. Engineering analysis of heat exchanger elements and design of heat exchangers. Team design project requiring synthesis of analytical and empirical elements. Prerequisites: ME 123, 225.

225 Introduction to Fluid Dynamics. Fluid statics, kinematics, the Bernoulli equation, integral and differential forms of the continuity and momentum equations, potential flow, vorticity, laminar viscous flow, dimensional analysis and similitude, laminar and turbulent pipe flow, flow over immersed bodies, boundary layers. Prerequisites: MTH 163/165, 164; ME 120, 123.

226. Introduction to Solid Mechanics. Loads and displacements, axial loading stress and strain in solid medium mechanical properties of materials. Laws of elasticity, thermal stresses, pressure vessels, principal stresses and strains, plane stress and plane strain. Torsion and bending of beams. Buckling energy methods. Buckling. Prerequisite: ME 120.

227. Applied Fluid Dynamics. Selected topics in fluid dynamics as applied in engineer-ing practice. Topics include pipe flow, pipe networks, open-channel flow, flow in turbines and pumps, low-speed aerodynamics, drag reduction, and hydrodynamic lubrication. Assignments include design of fluid components and systems. Individual design projects. Prerequisite: ME 225.

241. Fluid Dynamics Laboratory. Introductory lectures on lab practice and data analysis. The first part of the lab uses simple experiments to familiarize the student with instrumentation and digital data collection for fluid dynamics, heat transfer, and heat power. In the second part, students (working in groups of three) perform experiments designed by them. Reports are given both orally and in writing. Prerequisite: ME 225.

242. Materials and Solids Laboratory. Fundamentals of experimentation, including instrumentation, data analysis, oral and written reports, and poster presentation. Lectures, short instrumentation labs (tensile testing, strain gages, LVDT, RVDT, vibration, Charpy test), and an independent project. Prerequisites: ME 121, 226, 280.

251. Heat Power Applications. Power cycles, engines, compressors and turbines, refrigeration cycles, air conditioning, direct energy conversion, energy storage, and combustion. A design project is included. Prerequisites: ME 123, 225 (may be taken concurrently).

252. Modern Energy Conversion. Conversion of chemical and nuclear energy into mechanical and electrical energy. Energy sources and their projected use. Conventional electric power generation, thermoelectric and thermionic systems and fuel cells, fission, controlled fusion, and magnetohydrodynamic power generation. Design project. Prerequisite: ME 123.

253. Nuclear Engineering. Nuclear structure, nuclear reactions, fission, nuclear power plants, neutron diffusion, reactor theory, reactor kinetics. Course is open to seniors in engineering and sciences with some exposure to modern physics and an introduction to partial differential equations.

254. Finite Elements. The theory and application of finite element analysis in structural mechanics and other disciplines. Topics: matrix analysis concepts; element formulation methods; element behavior and geometry; global analysis aspects; isoparametric elements; elements for C_1 continuity problems. Prerequisite: ME 226.

280. Introduction to Materials Science. Relationship between microstructures of solid materials and their engineering properties. The dependence of mechanical, electronic, magnetic, thermal, and chemical properties of metals, semiconductors, ceramics, polymers, and glasses on their chemical bonding, electronic structure, atomic arrangement, and phase composition. Prerequisites: MTH 163/ 165, 164.

281. Mechanical Properties of Materials. Isotropic and anisotropic elasticity. Yield criteria and yield surfaces for polycrystals and single crystals. Slip-line solutions. Plasticity, defects, strengthening mechanisms. Ductility, work hardening, hardness. Creep. Effects of stress, temperature, and microstructure on strain-rate. Constitutive laws for metals, semiconductors, ceramics, glasses, polymers. Deformation mechanism maps and isomechanical groups. Examples selected from forging, rolling, extrusion, machining, wear. Prerequisites: MTH 163/165, 164.

390. Supervised Teaching.

391. Independent Reading.

392. Special Topics Seminar.

393. Special Essay or Thesis.

394. Internship.
395. Independent Research.

The following graduate courses are open to advanced undergraduates with permission of the instructor.

401. Methods of Applied Mathematics.
402. Partial Differential Equations. 403. Computational Methods for Engineering and Science.
404. Perturbation and Asymptotic Analysis.
405. Diffusion.
406. Dynamical Systems.
407. Advanced Dynamics.
408. Phase Transformations.
411. Mechanical Properties of Polymers.
421. Physical Rheology.
424. Introduction to Robust Design and Quality Engineering.
428. Geophysical Fluid Dynamics.
434. Introduction to Plasma Physics I.
435. Introduction to Plasma Physics II.
436. Compressible Flow.
437. Incompressible Flow.
440. Mechanics of Structures.
441. Finite Elements.
442. Introduction to Dislocation Plasticity.
443. Applied Vibrations Analysis.
444. Continuum Mechanics.
445. Plates and Shells.
446. Wave Propagation in Elastic Media.
447. Mechanics of Composite Materials.
448. Structural Stability.
449. Theory of Elasticity.
450. Optimum Design.
451. Crystallography and X-Ray Diffraction.
452. Electron Microscopy.
458. Nonlinear Finite Element Analysis. 459. Advanced Finite Elements.
460. Thermodynamics of Solids.
461. Fracture and Fatigue.
462. Experimental Material Science.
463. Microstructure and Mechanical Properties.
481. Mechanical Behavior of Solid Materials.
482. Biofluid Mechanics.

OPTICS

Govind P. Agrawal, Ph.D. (Indian Institute of Technology) *Professor of Optics and of Physics and Senior Scientist in the Laboratory for Laser Energetics*
Nicholas P. Bigelow, Ph.D. (Cornell) *Lee A. DuBridge Professor of Physics and Professor of Optics and Senior Scientist in the Laboratory for Laser Energetics*
Robert W. Boyd, Ph.D. (California, Berkeley) *M. Parker Givens Professor of Optics and Professor of Physics*
Thomas G. Brown, Ph.D. (Rochester) *Professor of Optics and Scientist in the Laboratory for Laser Energetics*
Joseph H. Eberly, Ph.D. (Stanford) *Andrew Carnegie Professor of Physics and Professor of Optics*

Philippe Fauchet, Ph.D. (Stanford) *Distinguished Professor of Electrical and Computer Engineering, Professor of Optics, of Materials Science, of Biomedical Engineering, and of Physics; Senior Scientist in the Laboratory for Laser Energetics*

James R. Fienup, Ph.D. (Stanford) *Robert E. Hopkins Professor of Optics, Professor of Electrical and Computer Engineering, and in the Center for Visual Science, and Senior Scientist in the Laboratory for Laser Energetics*

Thomas Foster, Ph.D. (Rochester) *Professor of Imaging Sciences, of Optics, and of Physics*

Nicholas George, Ph.D. (California Institute of Technology) *Wilson Professor of Electronic Imaging and Professor of Optics*

Stephen D. Jacobs, Ph.D. (Rochester) *Senior Scientist in the Laboratory for Laser Energetics and Professor of Optics, of Chemical Engineering, and of Materials Science*

Wayne H. Knox, Ph.D. (Rochester) *Professor of Optics and Senior Scientist in the Laboratory for Laser Energetics; Director, The Institute of Optics*

Duncan T. Moore, Ph.D. (Rochester) *Rudolf and Hilda Kingslake Professor in Optical Engineering Science and Professor of Optics, of Biomedical Engineering, and of Business Administration in the William E. Simon Graduate School of Business Administration; Vice Provost for Entrepreneurship*

Lukas Novotny, Dr. Sc.Techn. (Swiss Federal Institute of Technology) *Professor of Optics, of Physics, and of Biomedical Engineering and Scientist in the Laboratory for Laser Energetics*

Jannick Rolland, Ph.D. (Arizona) *Brian J. Thompson Professor of Optical Engineering and Professor of Optics and of Biomedical Engineering*

Carlos R. Stroud, Jr., Ph.D. (Washington) *Professor of Optics and of Physics*

Kenneth J. Teegarden, Ph.D. (Illinois) *Professor of Optics*

Ian A. Walmsley, Ph.D. (Rochester) *Adjunct Professor of Optics*

Gary W. Wicks, Ph.D. (Cornell) *Professor of Optics; Associate Director, The Institute of Optics*

David R. Williams, Ph.D. (California, San Diego) *William G. Allyn Professor of Medical Optics, Professor of Optics, of Brain and Cognitive Sciences, of Ophthalmology, of Biomedical Engineering, and in the Center for Visual Science; Director, Center for Visual Science*

Emil Wolf, Ph.D. (Bristol), D.Sc. (Edinburgh) *Wilson Professor of Optical Physics and Professor of Optics*

Miguel A. Alonso, Ph.D. (Rochester) *Associate Professor of Optics*

Andrew J. Berger, Ph.D. (M.I.T.) *Associate Professor of Optics and of Biomedical Engineering*

Chunlei Guo, Ph.D. (Connecticut) *Associate Professor of Optics*

John Marciante, Ph.D. (Rochester) *Associate Professor of Optics and Scientist in the Laboratory for Laser Energetics*

Wolf Seka, Ph.D. (Texas) *Senior Scientist in the Laboratory for Laser Energetics and Associate Professor of Optics*

James M. Zavislan, Ph.D. (Rochester) *Associate Professor of Optics, of Dermatology, of Ophtalmology, and of Biomedical Engineering; Director of Institute Ventures*

Julie Bentley, Ph.D. (Rochester) *Adjunct Assistant Professor of Optics*

David Berg, M.S. (Rochester) *Adjunct Assistant Professor of Optics*

Dale Buralli, Ph.D. (Rochester) *Adjunct Assistant Professor of Optics*

Jennifer Kruschwitz, M.S. (Rochester) *Adjunct Assistant Professor of Optics*

James Oliver, M.S. (Rochester) *Adjunct Assistant Professor of Optics and Research Engineer in the Laboratory for Laser Energetics*

Brian McIntyre, M.S. (SUNY, ESF) *Instructor and Senior Engineer*

Brian J. Thompson, Ph.D. (Manchester) *Provost Emeritus and Distinguished University Professor and Professor Emeritus of Optics*

M. Parker Givens, Ph.D. (Cornell) *Professor Emeritus of Optics*

Robert E. Hopkins, Ph.D. (Rochester) *Professor Emeritus of Optics*

Optics is the subject that deals with the generation, propagation, detection, manipulation and application of light. Having awarded the nation's first B.S. degree in optics in 1932, the University of Rochester's Institute of Optics has established itself as one of the world's leading centers for teaching and research in the rapidly expanding field of optics. The invention of the laser in 1960 and other important developments opened up many new possibilities, including fiber-optic communications, holography, optical information storage (CD technology, for example), electronic imaging, and more, so that today, optics has become one of the technological pillars of modern society. Optics also contributes much to modern science, figuring prominently in a number of recent Nobel prizes.

Rochester students completing the B.S. in optics in recent years have chosen to pursue graduate studies in optics, physics, electrical engineering, or biomedical engineering; to accept positions as optical engineers in the thriving optics industry; to work in engineering sales; to attend medical school or law school; or to enter a business program to pursue an M.B.A. In addition to traditional career directions, medicine and law offer significant opportunities today for someone with a background in optics. Optical instrumentation and techniques are becoming very important in medical research and medical practice, so an M.D., or an M.D./Ph.D., with a B.S. in optics

is uniquely educated to become a key participant in these emerging areas. Likewise, because of the strong entrepreneurial spirit of the optics community, a patent attorney with a B.S. in optics can establish a very active practice.

The optics curriculum provides the depth and breadth needed to prepare for a variety of career options. The foundations of optics are covered by the required coursework, including lasers, geometrical and physical optics, electromagnetic theory, quantum mechanics, and optical and optoelectronic devices, instruments, and measurement techniques. Optics majors can supplement their required coursework with a number of electives to tailor their programs to their specific interests. The faculty encourages optics majors to become involved in the world-class research programs that are a distinctive part of The Institute's culture.

Students may also gain experience in engineering project planning and execution via an honors project or internship. These are designed to help students translate knowledge acquired in the classroom to practical applications.

ADMISSION REQUIREMENTS

Students normally apply for admission to The Institute of Optics at the end of the sophomore year by submitting a concentration approval form to their advisor or to the chair of the Undergraduate Committee. Admission requirements are as follows:

1. an overall grade-point average of at least 2.0
2. a grade-point average of at least 2.0 in PHY 121, 122, or 142, and 123 or 143, or in those courses taken to fulfill the physics requirement
3. a grade-point average of at least 2.0 in MTH 161, 162, 163 or 165, and 164, or in those courses taken to fulfill the math requirement
4. a grade of C or better in each of OPT 241 and 261
5. completion of WRT 105 with a grade of C or better

For graduation, a minimum cumulative grade-point average of 2.0 is necessary for all courses taken in The Institute of Optics, as well as an overall average of 2.0. Additionally, a student must have at least 130 credit hours completed upon graduation.

The faculty of The Institute of Optics recognize achievement among our graduates by noting those who graduate with distinction based upon their average grades in their core optics courses. In particular, students who have a GPA of 3.85 or higher in the core OPT courses will receive their degrees with Highest Distinction; those with GPAs between 3.60 and 3.84 will be noted to have achieved High
Distinction; and those who have GPAs between 3.25 and 3.59 will receive Distinction.

Prospective students and undergraduates considering optics as a major are encouraged to write or to visit The Institute of Optics for more information and individual counseling.

FOUR-YEAR PROGRAM

First Year

MTH 161[1]	MTH 162[1]
CHM 131	PHY 121
WRT 105	WRT 105 (if closed out OPT 101[2] in fall semester)
	OPT 241[4]

Second Year

MTH 164[1]	MTH 163[1]
PHY 122 or 142	PHY 123 or 143
OPT 211	OPT 261
Cluster course	Cluster course

Third Year

OPT 242[3]	OPT 262
OPT 224	OPT 287
MTH 281	ECE 210
Cluster course	Cluster course

Fourth Year

OPT 226	OPT 223
OPT 256[4]	OPT 300
Elective (tech. or free)	Elective (tech. or free)
Cluster course	Elective (tech. or free)

Outstanding students are encouraged to take the physics sequence recommended for physics majors—first year: PHY 121 (fall), PHY 142 (spring); second year: PHY 143 (fall), physics elective (spring). Students choosing this sequence should also take CHM

131 before the end of the second year.

There is an electronic circuits requirement which may be satisfied by ECE 210, and a computing requirement which may be satisfied by OPT 211, another programming course, or by an examination administered by the administrative committee of the department.

Mastery of prerequisite courses is essential to ensure successful performance in subsequent courses. For cases in which the student has not achieved a "C–'' or better in the prerequisite course(s) for a given optics course, special permission of the Optics Undergraduate Committee is required before the student is allowed to register. Optics courses may be retaken only once (without special permission). Students so advised are asked to seek guidance in planning their future program from their faculty advisors.

DISTRIBUTION REQUIREMENTS
In accordance with the Rochester Curriculum, students must complete one cluster (three courses) from the humanities division and one cluster (three courses) from the social sciences division. Minors in these areas will also satisfy this requirement.

TECHNICAL ELECTIVES
Two electives must be technical electives.

The following courses are approved as technical electives for optics majors:
1. Any course with a 200 number or higher from Engineering, physics and astronomy, mathematics, chemistry, or the biological sciences, with the exception of ME 201, ME 202, or any required course.
2. A computer course with a 200 number or higher.
3. ECE 210 (circuits).
4. Any other technical course as approved by petition to The Institute of Optics, Undergraduate Committee.

NOTE: STT 211 and STT 212 (statistics) cannot be counted as technical electives.

OPTICS HONORS PROGRAM
The aim of this program is to offer qualified students increased exposure to the research being conducted at the Institute, increased interaction with faculty, and a chance to apply creativity to a research project. The program consists of 8 semester hours (which may be counted as technical electives). These hours include reading and research under the supervision of a faculty member. Students having a cumulative grade-point average of 3.6 or better are automatically eligible for this program. However, a 3.4 (overall) GPA is needed to maintain honors status. Students will be notified of their eligibility for the Honors Program in the spring semester of their junior year.

MINOR IN OPTICS
Students interested in completing a minor in optics should meet with a faculty member of the Institute of Optics to plan a focused program of study. Optical technologies continue to assume greater importance in a range of applications and a stronger grasp of the field has become a desirable option for majors in other science and engineering disciplines. The requirements for a minor in optics are satisfied by receiving grades of C or better in five optics courses and one of the courses must include a lab component. The program of study must include OPT 241, 261, and 300, and a selection from among the other courses taught within the Institute at the 200 level or above. The lab component may be satisfied with OPT 197, 198, or 256 or independent research.

B.S.-M.S. PROGRAM IN OPTICS
Undergraduate juniors majoring in optics may apply for admission into a five-year program leading to both a B.S. and an M.S. degree in optics. Students may apply for this program in the fall of their junior year and, if accepted, can begin master's-level independent work during the senior year. The B.S. is awarded at the end of the fourth year. Work or study for credit in the summer between the fourth and fifth years can be arranged, if desired. The fifth year of this program contains more advanced coursework, reading, and research than the normal curriculum. Students may follow the master's thesis (Plan A) or the nonthesis (Plan B) route. The thesis route is particularly recommended as it allows the student to develop a very high level of expertise in a specialized field of optics.

The normal fourth- and fifth-year programs for students in this program area are as follows:

Fourth Year

OPT 226	OPT 256
OPT 461 or 441	OPT 462 or 442
OPT 425	OPT 444
OPT 224	Elective (Optics)

Summer Work or Study (optional)

OPT 491, 493, or 495 (up to 6 credits)

Fifth-Year—Plan A (with thesis)

OPT 461 or 441	OPT 442 or 462
OPT 491	OPT 491
Elective (Optics)	Elective (Optics)

Fifth-Year—Plan B (without thesis)

OPT 461 or 441	OPT 462 or 442
3 Electives (Optics)	3 Electives (Optics)

The elective courses in the fifth year may be any of the 400-level courses in optics. It is also recommended that the student take a sequence of courses in a particular area to develop a specialty. Certain courses in other departments are also acceptable, but such courses should be approved in advance by a faculty advisor.

UPPER-LEVEL WRITING REQUIREMENT

OPT 241 and 256 fulfill the upper-level writing requirements.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

101. Optics in the Information Age. Begins with a discussion of the properties of light: refraction, imaging, diffraction, interference, the historical development of optical instruments (microscope, telescope, and laser) then moving into such topics as the Internet, high-speed information access, information storage and display, and also new medical applications. Includes classroom demonstrations and laboratory exercises.

Courses 197 and 198 are one-credit laboratory courses designed to complement the classroom material offered in the first three years. These laboratories emphasize practicalproblem solving, measurement, and presentation skills in various aspects of geometrical optics, physical optics, metrology, and photonics/optoelectronics.

196. This course is intended to supplement OPT 101 during the fall semester. It is not required for the optics major, but first-semester freshmen are encouraged to enroll.

197. This course accompanies OPT 241 in the spring semester and is normally taken during the first year. It is a required course for undergraduate optics majors.

198. This course accompanies OPT 261 in the spring semester and is normally taken during the second year. It is a required course for undergraduate optics majors.

211. Computational Methods in Optics. This course introduces techniques of transforming continuous problems to discrete mathematical models. Students learn computational methods for solving problems in optics using high-level software. Includes labs. Prerequisites: MTH 162 and concurrent enrollment in MTH 164.

223. Quantum Theory of Optical Materials and Devices. Introduction to quantum mechanics in the context of modern optics and optical technology. Wave mechanics applied to electrons in crystals and in quantum wells. Absorption and emission in semiconductors and the optical properties of materials. Semiconductor junctions in photodetectors and photoemitters.

224. Fundamentals of Lasers. Optical devices including lasers, modulators, and optical wave guides. Emphasis is placed on developing the basic principles needed to design new devices, as well as an understanding of the operation of those currently in use. Prerequisite: some knowledge of simple quantum mechanics and scalar diffraction theory is assumed. Optics majors should have taken OPT 241 and 261. MTH 163 is recommended.

226. Optoelectronics I: Devices. Introduction to the physics of optoelectronics. Light propagation in restricted geometries including waveguides and optical fibers. Dispersion and loss in linear and nonlinear pulse propagation. Passive optoelectronic devices: detectors and couplers. Active optoelectronic devices: lasers and modulators. Coupling between passive and between active and passive elements.

232. Optomechanical Design. Concepts required to achieve goals of optical system performance, combining of glass with metal or plastic, kinematic design, material limitations, effects of gravity and temperature. Applications to optical metrology, alignment, geometry 2-D and 3-D, and generation of precision diffraction gratings. Standards for straightness, flatness, roundness, and length.

241. Geometrical Optics. Optical instruments and their use. First-order Gaussian optics and thin-lens system layout. Photometric theory applied to optical systems. The eye, magnifier, microscope, matrix optics, nature of Seidel aberrations. Laboratory. Prerequisites: MTH 161; optics computing requirement.

242. Aberrations, Interferometers, and Optical Testing. Geometrical and diffraction theory of image formation. Optical transfer functions. Measurement of first-order properties. Seidel aberrations. Tests of aberrated systems. Seidel contribution formulae. Two-

beam interferometry. Interferometers in optical testing. Shearing, point diffraction, and heterodyne interferometers. Prerequisites: OPT 241, 261.

243. Optical Fabrication and Testing Laboratory. Credit—2 hours. Fabrication of a plane parallel plate, lens, or prism from a variety of optical glasses; controlled loose abrasive grinding and pitch polishing skills; optical metrology, including interferometry and evaluation of roughness. Optics seniors only (or with permission of instructor).

246. Optical Interference Coating Technology. Optical interference in a multilayer stack and its application to anti-reflection coatings, beamsplitters, laser mirrors, polarizers, and bandpass filters. Prerequisite: OPT 262.

252. Colorimetry. Principles and uses of CIE system of colorimetry, additive and subtractive color-mixture calculations, color-difference evaluation, uniform color scales, chromatic adaptation, computer colorant formulation, metameric colors, color-rendering properties of light sources.

256. Optics Laboratory. Intensive labor-atory course with experiments on optical imaging systems, testing of optical instruments, diffraction, interference, holography, lasers, detectors, spectroscopic instruments. Prerequisites: OPT 242, 261, and 262.

261. Interference and Diffraction. Com-plex representation of waves; scalar diffraction theory; Fresnel and Fraunhofer diffraction and application to measurement; diffraction and image formation; optical transfer function; coherent optical systems, optical data processing, and holography. Prerequisites: MTH 164 and PHY 122 or 142.

262. Electromagnetic Theory. Vector analysis, Maxwell's equations, energy flow in electromagnetic fields, dipole radiation from Lorentz atoms, partially polarized radiation, spectral line broadening, dispersion, reflection and transmission, crystal optics, electro-optics, quantum optics. Prerequisites: MTH 163, 164, PHY 122 or 142, and PHY 123 or 143.

263K. Quantum Optics Laboratory. A study of several applications including entanglement and Bell's inequalities, single-photon interference, single-emitter confocal fluorescence microscopy, among others; over four laboratory experiments culminating with an oral presentation and examination of photonics-based quantum computing and quantum cryptography. Students also devise a full-fledged potential business plan based on the implementation of this technology.

276. Medical Optics. Major topics are biomedical spectroscopy (absorption, fluorescence, Raman, elastic scattering); propagation of photons in highly scattering media (such as tissue); techniques for high-resolution imaging in biological media: confocal imaging, multiphoton imaging, and optical coherence tomography.

287. Mathematical Methods for Optics and Physics. A capstone course to examine the mathematical tools necessary for physics and optics in order to gain insight and experience in their application. Prerequisites: MTH 161–164 or 165, MTH 281.

300. Current Optics and Optical Technology. A survey of advanced experimental and theoretical methods of modern optics, conducted as a series of seminars by experts from the faculty and industry. The objective of this course is to prepare students for careers in optical science or engineering by providing a broadly-based overview of current technology and techniques in optics. Prerequisites: OPT 224, 241, 242, 256, 261, and 262.

307. SEM Practicum. A closely supervised training in use of the scanning electron microscope.

391. Independent Reading.

392. Special Topics.

393. Special Essay.

395. Undergraduate Research Projects.

396. Honors Project. Reading or research course open by special permission to seniors in optics.

The following graduate courses are open to advanced undergraduates with permission of the instructor.

407. SEM Practicum.

411. Mathematical Methods for Optics.

412. Quantum Mechanics for Optics.

425. Radiation and Detectors.

428. Optical Communications.

441. Geometrical Optics.

442. Instrumental Optics.

443. Optical Fabrication and Testing.

444. Lens Design.

448. Principles of Eye Design.

461. Physical Optics I.

462. Physical Optics II.

463. Nano Optics.

465. Principles of Lasers.

467. Nonlinear Optics.

468. Waveguide and Optoelectronic Devices

***491. Reading Course in Optics (M.S.)**

492. Special Topics in Optics (e.g., Nano-Optics, Medical Optics, Optics & Liquid Crystals).

***495. Research in Optics (M.S.)**

INTERDISCIPLINARY PROGRAMS
GEOMECHANICS

PROGRAM ADVISORS

*Roger F. Gans, Ph.D. (California, Los Angeles) *Professor of Mechanical Engineering*
John Tarduno, Ph.D. (Stanford) *Professor of Geophysics and of Physics and Astronomy*

The program in geomechanics is a joint offering of the Department of Earth and Environmental Sciences and the Department of Mechanical Engineering, and leads to the degree of bachelor of science in geomechanics. The program provides an unusual opportunity for students interested in the quantitative aspects of the earth sciences.

The curriculum emphasizes the application of the principles of mechanics to problems associated with the atmosphere, the oceans, and the solid earth. The program is a natural blend between the two departments and builds on several areas common to engineering and to quantitative earth sciences: the mechanics of fluids, the mechanics of solids, and the properties of materials.

Students who successfully complete this program will be well equipped for employment or graduate studies in a number of fields, such as civil and other engineering disciplines, geology and geophysics, hydrology, engineering geology, and other related fields. Career opportunities include work with the U.S. Geological Survey and with departments of natural resources or environmental protection at the federal, state, and county levels, with the oil and mineral resources industries, and in multidisciplinary private consulting firms engaged in geological engineering.

CURRICULUM

The geomechanics curriculum is built around basic mathematics, physics, chemistry, earth and environmental sciences, and engineering courses. The required earth and environmental sciences courses cover geologic processes, the evolution of the earth, mineralogy, and structural geology. Required engineering courses deal with basic mechanics, thermodynamics, fluid mechanics, and solid mechanics.

Technical electives, chosen from a number of earth and environmental sciences and engineering offerings, include courses in geophysical fluid dynamics, optical mineralogy, advanced mechanics, heat transfer, rheology, rock mechanics, materials science, geophysics, sedimentary processes, and laboratory studies.

The program also allows three free electives, which each student may choose to suit his or her special interests. For example, a student can elect to study environmental problems by taking courses in air and water pollution and in ecology. Training in environmental planning and policy work may be obtained by taking courses in earth and environmental sciences and public policy, environmental decisions and operations research. Many other special programs can be developed in such areas as water resources problems, advanced fluid dynamics of atmospheres and oceans, or advanced rock mechanics and structural geology. The student is encouraged to approach faculty regarding projects of interest.

For preparation in mathematics, the program requires MTH 161, 162, ME/MTH 163, and ME/MTH 164 (or the equivalent five-course sequence: MTH 141, 142, 143, ME/MTH 163, 164). The required physics courses are PHY 121, 122, and 123, and the required chemistry course is CHM 131. In earth and environmental sciences, EES 101, 201, 204, and 208 are required; and in mechanical engineering, the requirements are ME 120, 123, 225, 226, and either 241 or 242.

In addition to the above courses, there are four technical electives, which may be any of the earth and environmental sciences or mechanical engineering courses at the 200 level or higher, and one technical elective from any discipline, as agreed upon with the faculty advisor.

The program includes three free electives to allow a strong minor in an area of particular interest to the student, or to broaden the scope of the curriculum. Other general degree requirements, including distributive requirements, are those listed below.

ADMINISTRATION

The geomechanics degree is awarded by the College in either arts and sciences or engineering and applied sciences—the choice is

made by the student. If the student chooses arts and sciences, his or her major advisor will be in the Department of Earth and Environmental Sciences; if the degree is to be granted through engineering and applied sciences, the major advisor will be in the Department of Mechanical Engineering. In each case, the student will also have a minor advisor in the other department.

Below is a sample arrangement of courses. Considerable variations on this ordering are possible to accommodate transfers and special needs.

FOUR-YEAR PROGRAM IN GEOMECHANICS

First Year	
MTH 161[1]	MTH 162[1]
EES 101	PHY 121
WRT 105 (Primary Writing)	ME 120
Elective	Elective (cluster)
Second Year	
MTH 163	MTH 164
PHY 122, 181	PHY 123
Elective (cluster)	ME 123
Elective	EES 201
Third Year	
CHM 131	Elective (technical)
ME 225	ME 226
Elective (technical)[2]	PHY 183
Elective (technical)[2]	Elective (cluster)
	Elective (cluster)
Fourth Year	
EES 208	EES 204
Elective (technical)[2]	Elective (technical)[2]
Elective (cluster)	Elective (technical)[2]
Elective	Elective (cluster)

INTERDEPARTMENTAL PROGRAMS

PROGRAM COMMITTEE

Thomas Y. Hsiang, Ph.D. (Berkeley) *Professor of Electrical and Computer Engineering; Associate Dean of the Hajim School of Engineering and Applied Sciences, Chair of the Program*

Renato Perucchio, Ph.D. (Cornell) *Professor of Mechanical Engineering and of Biomedical Engineering*

Robert C. Waag, Ph.D. (Cornell) *Arthur Gould Yates Pro-fessor of Engineering, Professor of Electrical and Computer Engineering and of Imaging Sciences*

Chunlei Guo, Ph.D. (Connecticut) *Associate Professor of Optics*

Mitchell Anthamatten, Ph.D. (M.I.T.) *Assistant Professor of Chemical Engineering and Scientist in the Laboratory for Laser Energetics*

Kevin Davis, Ph.D. (Boston) *Assistant Professor of Biomedical Engineering and of Neurobiology and Anatomy*

BACHELOR OF SCIENCE IN ENGINEERING AND APPLIED SCIENCE

The interdepartmental degree, B.S. in Engineering and Applied Science (BS/IDE), is intended for students who have specific tech-

nical objectives not adequately addressed by the other B.S. degree programs offered by the Edmund A. Hajim School of Engineering and Applied Sciences. For example, students with interests in patent law or in architectural engineering have crafted programs of study well suited to their specific educational objectives through the Interdepartmental Program.

Within the total of 32 courses (128 credit hours) required to earn the B.S. degree, a minimum of 18 are devoted to mathematics, other natural sciences, and engineering. Of these, at least eight must be courses offered by the Hajim School of Engineering and Applied Sciences. A minimum of nine additional courses, are devoted to satisfying the primary writing requirement, upper-level writing requirement, and two clusters, one in humanities and one in the social sciences.The remaining courses may be free electives. Students frequently use these courses to pursue one of the many certificates offered by the University or a minor in one of the disciplines in the humanities or social sciences.

Each degree program under BS/IDE must include three sequences of technical or scientific courses. Each sequence must include at least three courses, only one of which may be at the 100 level. A sequence of courses is defined as "a logical progression of study, confined to an acceptably identifiable area, which later material builds upon and extends earlier material.'' (In rare cases, the Committee has approved the use of a nontechnical or nonscientific sequence to strengthen the focus of a program when a student wishes to study such a discipline in depth.)

A final degree requirement under BS/IDE is a senior thesis. The thesis is a coherent, written summary of independent study, in the focus area of the program, undertaken under the supervision of an appropriate member of the engineering faculty during a student's junior and senior years. Up to 8 credit hours of independent study may be included in a student's program. During the second semester of the sophomore year, a prospective BS/IDE student is expected to seek out and work with an appropriate faculty member to define an area of independent study. A brief description of the topic along with the supervising faculty member's signature is submitted by the end of the sophomore year as part of the application for admission to BS/IDE.

Students are expected to enter with and to maintain strong academic records. All students in the program must earn a minimum cumulative grade-point average of 2.0 for all courses taken in their fields of specialization. This includes all courses in their sequences as well as the eight required engineering courses. In addition, each student entering the program must have completed the following subjects with a grade-point average of at least 2.7: primary writing, one course; mathematics, three courses, including one in differential equations (usually MTH 163); chemistry and physics, four courses, at least one in each. Full details of both admissions and degree requirements under BS/IDE are provided in documents available from the Dean's Office in 306 Lattimore Hall.

Students who are attracted to engineering and who are either unsure of specialization within the field or who have specific interests not obviously addressed by the standard programs are strongly encouraged to contact the Dean's Office in Lattimore Hall for information on guidelines and degree requirements.

BACHELOR OF ARTS IN ENGINEERING SCIENCE

The B.A. in engineering science (BA/ES) is intended for students who, while not necessarily planning careers in the practice of engineering, may benefit from an enhanced technical content in their education. Technology and corresponding modes of thought are becoming ever more important in issues affecting everyone. Examples include environmental issues, such as acid rain and the greenhouse effect; issues broadly related to medicine, such as gene splicing and the proper use of life support systems; legal issues, such as privacy of records in the computer age; and new regulative and ethical issues raised by developing technology.

The B.A. in engineering science emphasizes breadth across engineering disciplines and as such offers an exposure to technology not available via other degree programs. Thus, students considering careers in business, law, or medicine may find the B.A. program excellent preparation. The technological focus of the program may offer advantages in dealing with issues such as those listed above, when they are encountered in the role of corporate manager, lawyer, or physician. Alternatively, the program could be followed by more intense specialization in a specific engineer-ing discipline at the master's degree level.

Within the total of 32 courses (128 credit hours) required to earn the B.A. in engineering science, a -minimum of eight courses must be in the natural sciences disciplines, including at least one course in chemistry, two in physics, and three in mathematics. The latter must include a course in differential equations (typically MTH 163). Two additional courses in these or other -natural science disciplines are also required. Additional course requirements include one course in computing (CSC 170 or equivalent), and at least eight courses in engineering, including at least one laboratory-intensive course. The opportunity to take courses in depth from several engineering disciplines is a unique aspect of this program.

To earn the B.A. in engineering science, students must satisfy the primary and upper-level writing requirements and also must complete two clusters, one in the humanities and one in the social sciences.

Totaling the above course requirements leaves from five to eight courses available as free electives. This permits students considerable flexibility in shaping programs that reflect personal interests.

The BA/ES program is administered by the Committee on Interdepartmental Programs. Approval of the Committee is required for each proposed program of study. Admission to the program at the end of the sophomore year requires an overall grade-point aver-

age of at least 2.0, together with completion of the following nine courses with a GPA in these nine courses of at least 2.3: one primary writing course; three math courses, including a course in differential equations; three physics and chemistry courses, including at least one course in each; and at least two engineering courses.

Programs meeting degree requirements are to be worked out in consultation with an appropriate member of the Program Committee. Interested students—including potential transfer students—may obtain information and application forms from the Dean's Office in 306 Lattimore Hall.

UPPER-LEVEL WRITING REQUIREMENT

Significant writing experience in one's discipline is an important adjunct to the technical material one learns, and that experience is gained through upper-level writing courses in which a significant weight is given to the effectiveness of written communication. For students in the B.A. in engineering sciences or the B.S. in engineering and applied sciences, the upper-level writing requirement is satisfied by taking two or more of the courses that satisfy the upper-level writing requirement in the "traditional" engineering programs. Otherwise the student and the IDE Committee will stipulate in the student's plan where writing experience is to be gained. BME 101, 260, 396; CHE 246, 255, 273/4; ECE 111, 112, 113, 399; ME 204, 205, 211, 213, 223, 241, 242, 251; OPT 256, 300, 397 are engineering courses that can be used to fulfill the requirement for BA/ES and BS/IDE majors.

Eastman School of Music

Douglas Lowry, M.M. (Southern California) *Dean*

The Eastman education prepares students artistically, intellectually, and professionally for the challenging world in which musicians now live, and, importantly, instills a sense of mission about the value of music. Noted industrialist George Eastman established the school in 1921 as the first professional school within the University of Rochester, believing that a broad foundation in the liberal arts was a necessity for all musicians. Eastman's farsighted vision is integral to the school's central principles.

In recent years, changes in the culture and marketplace for classical music have led the Eastman School to engage in innovative curricular reform designed to educate the musician of the future. Several new programs, certificates, and diplomas aim to motivate and educate students to discover new ways to engage audiences in diverse communities; empower students to think entrepreneurially about music careers and related professional opportunities; and challenge students to influence and direct the future course of classical music.

More than 100 highly regarded performers, composers, conductors, scholars, and educators make up the Eastman faculty. Nearly 900 students are enrolled in Eastman's collegiate division—about 550 undergraduates and 350 graduate students. Approximately 2,000 applications are received each year, and about 135 freshmen and 125 graduate students are admitted. Students come from every state, and nearly 25 percent are international.

All undergraduates have a performance concentration in one of the following: bassoon, cello, clarinet, double bass, euphonium, flute, guitar, harp, horn, oboe, organ, percussion, piano, saxophone, trombone, trumpet, tuba, viola, violin, voice.

Eastman offers the following bachelor's, master's, and doctoral degrees:

- Bachelor of Music: composition; applied music; musical arts; music education; jazz studies and contemporary media (performance and writing skills); theory
- Master of Arts: composition; music education; musicology; ethnomusicology; theory; theory pedagogy; music education with teacher certification
- Master of Music: composition; music education; conducting (choral or orchestral); music education with teacher certification; jazz studies and contemporary media (performance or writing skills); performance and literature; opera (performance or stage directing); early music (emphasis in historical plucked instruments)
- Doctor of Musical Arts: composition;
  performance and literature; music education; conducting; piano accompanying and chamber music; jazz studies and comtemporary media; early music (emphasis in historical plucked instruments)
- Doctor of Philosophy: composition; music education; musicology; theory

Additionally, the Eastman School and the University's College together produce a variety of ways in which undergraduates at Rochester can choose to study music, often in combination with other fields. The Bachelor of Arts with a concentration in music is based within the College on the University's River Campus. The B.A. student majoring in music has access to the full range of resources of both a major private university and one of the world's leading music schools. The program has extraordinary opportunities for students who wish to pursue musical interests as the core of a liberal arts education.

Qualified College students may study privately at Eastman. College music majors have a wide selection of Eastman courses from which to choose for elective credit. A student may combine music and non-music study by actually applying to and completing two different degrees simultaneously (such as a B.M. in voice performance at Eastman and a B.A. in German at the College).

Choosing between these options can be challenging. The Office of Admissions at Eastman and the College Department of Music are wonderful sources of information for students contemplating a combined course of study at Eastman and at the College, or needing clarification on the differences between degree programs.

For all students at the University, as well as residents of the Rochester community, the Eastman School serves as a rich and vibrant resource. More than 700 performances (including concerts, recitals, and operas), most of them free of charge, are offered at the Eastman Theatre, Kilbourn Hall (a superbly constructed chamber music hall), and various other sites at the Eastman campus and throughout the Rochester area. These include performances by internationally known artists as well as faculty and students.

A separate academic bulletin, available through Eastman's Office of Admissions, fully details the Eastman School's programs. Prospective students are also encouraged to visit the school's Web site at www.rochester.edu/Eastman for additional information about the Eastman School, the programs, and the people; admissions forms; information on audition repertoire and scheduling; and tuition information.

Write to any Eastman office, department or faculty member at: Eastman School of Music, 26 Gibbs St., Rochester, NY 14604.

Also reach various school departments as follows:
General Eastman information: (585) 274-1000
Admissions Office: (800) 388-9695 (U.S.A. and Canada) or (585) 274-1060
Admissions e-mail: admissions@esm.rochester.edu
Recorded concert information (24 hours a day): (585) 274-1100
Community Music School: (585) 274-1400
Financial aid: (585) 274-1070
Graduate studies: (585) 274-1560
Sibley Music Library: (585) 274-1350

School of

Nursing

Kathy Parker, Ph.D., R.N., F.A.A.N. (Georgia State University) *Dean and Professor, School of Nursing*

The mission of the School of Nursing is to improve the health of individuals, families, and communities through innovation and collaboration in the integration of research, practice, and education. The School of Nursing prepares nurses to meet the challenges of health care in the twenty-first century. Our philosophy includes beliefs about nursing, nurses, consumers, environments, health, unification, and the educational process.

We believe the profession of nursing has as its essence assisting people to attain and maintain optimal health and to cope with illness and disability. Nursing derives its rights and responsibilities from society and is, therefore, accountable to society as well as to the individuals who comprise it. The nurse functions as a caring professional in both autonomous and collaborative professional roles, using critical thinking, ethical principles, effective communications and deliberative action to render holistic care, facilitate access to health care, and aid consumers in making decisions about their health.

The consumer of nursing care may be an individual, family, group, community, or society, who all have diverse and changing needs. We believe the consumer is self-determining and has the right to an informed choice about health. All actual consumers and potential consumers, including those who are disenfranchised from the health care system, have the right of access to health care.

Environment has a significant impact on health. Any setting in which consumers function is an appropriate environment for nursing practice. Nurses must be active in social, political, and economic arenas to shape policy that creates optimal environments for maximizing health.

Health is a subjective state which includes well-being; optimal functioning in all dimensions of life: biological, psychological, social, cultural, and spiritual; effective response to a continually changing environment; and achievement of personal potential. Health is affected by illness, disability, and dysfunction. Consumers ultimately define health for themselves and make decisions regarding it.

At the School of Nursing, faculty and learners function from the perspective of the Unification Model. Nursing practice, education, and research are the three interdependent elements of this model, each element enhancing the others. Unification embodies both a philosophical approach and an organizational structure which promotes and facilitates faculty practice and strengthens operational interdependence among practice, education, and research. Research strengthens education and practice through development of the nursing knowledge base. Practice enriches both research, through generation of questions, and education, through continual application of scientific knowledge. Education empowers nurses for leadership in professional practice and research. The interaction of these elements benefits the consumer through enhancement of the quality of nursing care.

The educational climate of the School of Nursing enhances respect, collaboration, and support among learners and faculty. A rigorous professional education prepares leaders in nursing who shape current and future responses to ethical, political, economic, health, and nursing issues. Critical thinking and decision making are basic to the delivery of health care. Consistent with the University's mission, the School of Nursing fosters individuality, self-direction, scholarship, and commitment to lifelong learning. Continued professional learning opportunities assist nurses in developing professional expertise. Creative, flexible programming in education is essential to meet the diverse and changing needs of both the learners and the nursing profession.

Programs of the School of Nursing are registered with the State Education Department of the University of the State of New York, Professional Education, West Wing Education Building, Washington Avenue, Albany, NY 12234, (518) 486-2967. Baccalaureate and master's programs are accredited by the Commission on Collegiate Nursing Education (CCNE). Nursing students and graduates are eligible for membership in nursing organizations such as the American Nurses' Association, the National League for Nursing, Sigma Theta Tau (the nursing honor society), and others, including specialty groups.

REQUIREMENTS FOR THE DEGREE
BACHELOR OF SCIENCE

The curriculum is designed to be more responsive to adult learners, and this is the focus of the baccalaureate nursing program.

Students are assigned an advisor when they are admitted to the University. The advisor assists students in planning an academic program to fulfill graduation requirements; counsels students concerning course-work and progression in the program; and provides resource information as needed by the individual student.

In addition to the specific courses stipulated in the degree program, students must satisfactorily complete the following:
1. A minimum total of 128 semester hours, or equivalent, of acceptable and satisfactory academic work.
2. A cumulative grade-point average of at least 2.0 for all courses taken for credit at the University of Rochester. The APNN-BS program requires a minimum grade of 73 (C /2.0) in all required courses.
3. A minimum of 32 hours of coursework at the School of Nursing for R.N. programs (49 credit minimum for accelerated programs for non-nurses).

In compliance with New York State regulations, immunization updates are required annually for all students in health profession programs. For students taking evening courses, escort services are available to transport students to University parking lots.

Additional information about the nursing curriculum and an application may be obtained by contacting: Student Affairs Office, University of Rochester School of Nursing, Box SON, 601 Elmwood Avenue, Rochester, NY 14642-8402; (585) 275-2375; www.son.rochester.edu.

PROGRAMS

Accelerated Programs for Non-Nurses Requirements

Students apply to either the one-year Accelerated Bachelor's Program for Non-Nurses (generalist preparation and eligibility to complete registered nurse licensure) or the three-year Accelerated Master's Program for Non-Nurses (additional nurse practitioner preparation in one of these specialty areas: adult, family, gerontological, pediatrics or pediatrics with behavioral mental health specialization, psychiatric/mental health—adult/family, acute care, and psychiatric/mental health—child/adolescent.

GENERALIST CURRICULUM (49 CREDITS FOR 1,275 CLOCK HOURS OF EDUCATION) INCLUDES 722 CLINICAL HOURS

Prerequisites

- Non-nursing bachelor's degree with preferred GPA 3.0/4.0
- Anatomy and Physiology
- Microbiology
- Growth & Development
- Nutrition
- Statistics

Semester I (17 credits)

- NUR 370 Pathophysiology/Pharmacology (6 credits: 6 theory credits)
- NUR 362 Comprehensive Health Assessment of the Individual (3 credits: 2 theory credits; 1 lab credit)
- NUR 372 Therapeutic Interventions I (4 credits: 1 theory credit; 2 clinical credits; 1 lab credit)
- NUR 373 Nursing Science (2 credits: 2 theory credits)
- NUR 378 Genetics (2 credits: 2 theory credits)

Semester II (16 credits)

- NUR 374 Childbearing/Childrearing (7 credits: 4 theory credits; 3 clinical credits)
- NUR 375 Psychiatric Mental Health (4 credits: 2 theory credits; 2 clinical credits)
- NUR 301 Principles and Application of Evidence for Nursing Practice (4 credits: 4 theory credits)
- UR 376 Therapeutic Interventions II (1 credit: 1 lab credit)

Semester III (16 credits)

- NUR 371 Management of Care (4 credits: 4 theory credits)
- NUR 377 Adult and Home Nursing (8 credits: 4 theory credits; 4 clinical credits)
- NUR 378 Genetics (2 credits: 2 theory credits)
- NUR 379 Nursing Integration & Transition to Practice (4 credits: 2 theory credits; 2 clinical credits)

SPECIALIST CURRICULUM

The specialist component consists of the existing master's curriculum and is composed of

- Professional core courses developed to provide common substantive areas of study for students from different clinical components
- Clinical specialty courses relating more directly to one or more clinical specialties
- Thesis (Plan A) and non-thesis (Plan B) options. Students must elect either Plan A (Thesis) or Plan B (Comprehensive Examination) as part of their program of study. Thesis option (Plan A)—NUR 495 is a 6-credit course and pertains to preparation for and completion of the master's thesis. Students who elect to complete a thesis register for NUR 495, and they move through the various stages of preparation of the thesis. Students who elect to complete a thesis can waive NUR 406 in lieu of 3 of the 6 required credits. In the non-thesis option (Plan B), Comprehensive Exam, successful completion of a written comprehensive examination will demonstrate students' abilities to integrate knowledge gained through individual courses into critical thinking as Advanced Practitioners.

Before beginning M.S. clinical courses, students must pass NCLEX and have a minimum GPA of 2.5.

R.N. to B.S. Program Requirements

ARTS AND SCIENCES COURSES (64 CREDITS)

- Humanities (e.g., English, fine arts, language, philosophy, religion, history)—9–12 credits (*three college-level courses)*
- Natural sciences (e.g., chemistry, biology, microbiology, anatomy, physiology, physics, geology, environmental sciences)—12–16 credits (*four college-level courses)*
- Social sciences, including statistics
  (e.g., psychology, sociology, anthropology, human development, economics)—12–16 credits (*four college-level courses; statistics required)*
- Free electives (non-nursing)—to total 64 arts and sciences credits

NURSING COURSES (64 CREDITS)

First 32 credits awarded automatically upon matriculation for all nursing coursework from an accredited diploma or associate's degree program.

Final 32 credits (residency requirement):

Four core courses—4 credits each (primarily online)

- NUR 301 Principles and Application of Evidence for Nursing Practice
- NUR 353 Health Policies and Decision Making in Health Care Systems
- NUR 354 Concepts of Leadership and Management
- NUR 355 Contexts of Health Care

Portfolio Seminars—1 credit each

- NUR 351 Portfolio Seminar I (taken at the beginning of program)
- NUR 352 Portfolio Seminar II (taken at the completion of program)
- It is possible to gain an additional 1–6 credits for prior learning/life experience documented during the portfolio seminars.

Nursing electives (8–14 credits)

R.N. to B.S. to M.S. Program Requirements

A combined baccalaureate-master's degree program in nursing is available for select registered nurses with well-defined career goals.

Requirements vary by master's specialty (the following M.S. nurse practitioner preparation programs: Adult N.P., Adult N.P./Geriatric N.P., Family N.P., Acute Care N.P., Care of Children and Families/Pediatric N.P., Care of Children and Families/Pediatric N.P. with Pediatric Behavioral Health N.P. option, Care of Children and Families/Pediatric N.P. /Neonatal N.P., Psychiatric/Mental Health N.P.—Adult/Family or Child/Adolescent). The arts and sciences requirements are the same as those in the R.N. to B.S. program. Two of the four core R.N. to B.S. nursing courses are replaced by graduate-level courses. Undergraduate nursing elective requirements vary from 0–4 credits. For more information about this program, please contact the Office of Student Affairs, (585) 275-2375.

COURSES OF INSTRUCTION

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

301. Principles and Application of Evidence for Nursing Practice. This course provides an introduction to evidence-based practice and the critical appraisal of best evidence literature. Students learn to formulate clinical questions in answerable format, search for and identify best evidence, and appraise that evidence for rigor and applicability to the clinical problem. Best evidence consists

of pre-appraised individual studies and overviews. Basic principles of scientific inquiry, quantitative and qualitative research methods, and research ethics are introduced in the context of clinically relevant research. (Fall and Spring)

311. Statistics for Health Sciences. This course is an introduction to the basic techniques of statistical analysis with particular application to the health science research. Topics include levels of data measurement,
descriptive statistics and data display; probability, significance, power, and parameter estimation; and hypothesis testing as inferential techniques. With the use of statistical software, the student develops the ability to choose and conduct appropriate statistical tests for the analysis of simple data sets and ability to interpret the results of those analyses. Statistical techniques introduced are correlation, regression, Chi-square, t-test, analysis of variance, logistic regression, and confidence limit estimation. (Summer)

351. and 352. Portfolio Seminar I and II. Credit—1 hour each. The purpose of the portfolio seminars is to use a self-reflective process to document college-level learning that students have achieved through past personal and professional experiences. Adult and self-directed learning theories are used to help students demonstrate prior learning and to document this learning in measurable ways that may translate into elective credits within a program of study. Students are assisted in creating individualized plans with supporting documentation that facilitates completion of R.N. to B.S. program requirements and positions them for future professional development. Upon completion of the Portfolio Seminars, there is the option of 1–6 additional elective credits awarded upon completion of variable credit petitions documenting learning outcomes. (Fall, Spring, and Summer)

353. Health Policies and Decision Making in Health Care Systems. This course provides an overview of decision-making processes used by professional nurses at the individual client and population levels. Strategies to affect health care policy decisions which shape health care systems are considered. Contemporary social and ethical issues as well as appropriate professional nursing roles are examined using concepts and principles of ethical decision making, human diversity, global health care, and epidemiology. The impact of information and health care technologies on nursing care is discussed. (Fall).

354. Concepts of Leadership and Management. This course provides an introduction to the fundamental principles of leadership and management pertinent to health care. Concepts and tools necessary for succeeding in a nursing leadership role in complex organizations are analyzed and applied. Students acquire a familiarity with performance improvement processes through discussion and class assignments. A field experience is required. (Spring)

355. Contexts of Health Care. This course examines the changing context of health care systems and the settings in which services are provided. Forces affecting the delivery and utilization of health care services are examined. This course exposes students to a variety of health care systems and explores the environment in which nursing and health care is provided. Selected issues related to health service provision are examined including managed care, nursing case management, and collaborative community partnerships. A field experience is required. (Fall)

362. Comprehensive Health Assessment of the Individual. Credit—3 hours. This course builds on the biopsychosocial sciences and focuses on techniques of history-taking and physical examination in a cross-cultural context. Using a systems approach, focused and comprehensive assessments of essentially well clients throughout the lifespan are addressed. Students describe findings and differentiate normal from atypical or abnormal. Diagnostic reasoning skills are developed through analysis of the assessment data. A laboratory/clinical experience provides opportunities for students to integrate communication, assessment, and problem-solving skills with fundamental nursing care procedures. Prerequisite: Anatomy and Physiology. (Spring and Summer)

370. Pathophysiology/Pharmacology. Credit—6 hours. This course focuses on the physiologic changes that occur as a result of disease processes, the clinical manifestations indicative of altered health and the drug therapy used to treat these disease processes. The course integrates anatomy, chemistry, microbiology, physiology, and pharmacology, and focuses on their application to clinical practice. (Spring, Summer)

371. Management of Care. This course prepares nurses to assume leadership roles by designing, managing, coordinating, and evaluating care in health care delivery systems. Content focuses on the role of the nurse leader in the care of populations and groups; planning and effecting change, quality improvement, securing and managing financial and human resources, developing effective teams and work groups, and utilizing informatics and other technology. Ethical issues and issues related to health service provision are examined including health care systems, population health programs, nursing case management, legal issues relative to nursing management, and selected professional concerns.
Pre-or co-requisite: NUR 301, 374, 375, 377. (Fall, Spring)

372. Therapeutic Interventions I. Therapeutic Interventions I is a clinical nursing course. This course focuses on acquisition of fundamental nursing skills. It is designed to also provide the student the opportunity to incorporate concepts and skills learned in Health Assessment in Health and Illness. It provides the student with a foundation for delivering therapeutic nursing care and interventions to individuals, families, and groups from diverse populations. In this course, the student applies this learning in various practice settings to care for diverse consumers including individuals and families desiring health promotion as well as those experiencing alterations in health. Pre- or co-requisites: Professional Rescuer Cardiopulmonary
Resuscitation Certification and NUR 362. (Spring, Summer)

373. Nursing Science. Credit—2 hours. The course introduces the student to multiple aspects of nursing including a historical and theoretical perspective of nursing, professional standards, utilization of the nursing process, critical thinking, and therapeutic communication skills in nursing practice**.** In addition, it provides a beginning foundation for evidence-based practice, epidemiologic

concepts, leadership development, and a framework of interdisciplinary teamwork in health care settings. (Spring, Summer)

374. Women's Health, Neonatal and Pediatric Nursing. Credit—7 hours. The student learns to use the nursing process to provide and evaluate care for individuals and families in the childbirth and childrearing stages of life. The student also learns about nursing role development as a collaborative interdisciplinary team member. This course provides nurses with a basic understanding of childbearing and pediatric nursing principles in a variety of clinical settings. Students are introduced to current research, theory, and biological foundations of childbirth and childrearing. The course content incorporates the American Nurses Association Standards of Practice, current treatment modalities, and legal implications of caring for pregnant women and children. Throughout the course, the role of the obstetrical and pediatric nurse is examined as the nursing process is applied to the care of patients bearing and raising children. Clinical experiences are coordinated in a variety of settings and offer students the opportunity to engage with clients and to interact with interdisciplinary teams in providing care. Prerequisites: NUR 370, 362, 372, and 373. Pre or co-requisite: NUR 301. (Fall and Spring)

375. Psychiatric Mental Health. The course provides students with a basic understanding of psychiatric and mental health nursing principles in a variety of clinical settings. Students are introduced to current research, theory, and biological foundations of mental disease and mental illness. The course content incorporates the American Nurses Association Standards for Practice, current treatment modalities, and legal implications of caring for mentally ill clients. Throughout the course, the role of the psychiatric nurse is examined as the nursing process is applied to the care of patients with psychiatric-mental health needs. Clinical experiences are coordinated in a variety of settings and offer students the opportunity to engage with clients and to interact with interdisciplinary teams in providing care. Prerequisites: NUR 362, 370, 372, and 373. Pre- or co-requisite: NUR 301. (Fall, Summer)

376. Therapeutic Interventions II. Credits—1 hour. This course focuses on the acquisition of selected complex nursing skills. Also provides students a laboratory foundation for delivering therapeutic nursing care and interventions to individuals that is applied to patients in concurrent or subsequent clinical specialty courses. Prerequisite: NUR 372. (Fall, Summer)

377. Adult and Home Nursing. Credits–8 hours. The student learns to use the nursing process to provide and evaluate culturally sensitive care for individuals and families experiencing adult health problems across diverse settings including home. The student also learns about nursing role development as a collaborative interdisciplinary team member. Students apply principles of evidence-based care in planning, providing, and evaluating patient care outcomes. Clinical experiences are coordinated in a variety of settings and offer students the opportunity to engage with clients and interdisciplinary health care members to provide care across the health continuum. Includes simulation laboratory experiences. Pre- or co-requisites: NUR 372, 376, and 301. (Fall, Spring, Summer)

378. Genetics. Credits—2 hours. This course provides nurses with basic information about the influences of genetics on human health and illness, practice in applying important tools for effective genetic nursing practice with consumers from various cultures and ethnic heritage, an arena for consideration of ethical and social implications of genetic knowledge, and experience in the use of printed matter and computers to support evidence-based health care and lifelong learning in applied human genetics. (Summer)

379. Nursing Integration & Transition to Practice. Credit—4 hours. This course provides a comprehensive review of nursing content areas and the application of the nursing process across specialties and settings. Includes simulation laboratory experiences. (Fall, Spring)

William E. Simon
Graduate School of

Business Administration

Mark Zupan, Ph.D. (M.I.T.) *Dean*

Although undergraduate degrees in business are not offered, the William E. Simon Graduate School of Business Administration cooperates with other University divisions in offering the 3-2 program, through which a student can earn in five years, instead of the usual six, a bachelor's degree in his or her undergraduate concentration and a Master of Business Administration degree.

EARLY LEADERS® AWARD AND SCHOLARSHIP PROGRAMS

In the fall of 2005, the Simon School introduced its *Early Leaders*® award and scholarship programs that offer special scholarships to applicants with zero to three years' work experience. Candidates are nominated by those from an extensive network of Simon School or University of Rochester alumni as well as 700 key influencers at top undergraduate liberal arts colleges nationwide, including professors, career services experts, academic advisors, and athletic directors. These individuals identify college sophomores, juniors, and seniors who seem to be likely candidates, using such criteria as strong written and oral communication skills; exceptional academic performance; leadership ability; a positive, "can-do" attitude; and the willingness to work hard. Nominees are eligible to have the $125 application fee waived and receive a Simon *Early Leaders* award. Those admitted to the Simon School become eligible for a $5,000 scholarship, at a minimum, and potentially, a full-tuition award. For more information on the Simon *Early Leaders* award and scholarship programs, visit www.simon.rochester.edu/simonearlyleaders.

THE 3-2 PROGRAM
LEADING TO A BACHELOR'S AND AN M.B.A.

The Simon School cooperates with the College at the University of Rochester in offering a combined undergraduate and graduate degree program. The 3-2 M.B.A. Program allows students to earn both a bachelor's degree in an undergraduate major and a Master of Business Administration degree in five years, rather than the traditional six.

Students in the 3-2 program study for three years in their undergraduate major and complete major and distributive course requirements. Between January and March of their junior year, qualified students apply for admission to the Simon School. After acceptance, they take the first year of the M.B.A. program, rather than the traditional "elective'' senior-year courses.

At the end of that year, 3-2 students should receive a bachelor's degree in their undergraduate major. They then complete the Simon School M.B.A. in one additional year.

3-2 PROGRAM FACTS

- A bachelor's degree and an M.B.A. degree are earned in five years.
- The program maintains all of the full-time M.B.A. program requirements.
- Admission to the 3-2 program is limited and is offered only to exceptionally well-qualified students.
- Students must enter in September.
- Some undergraduate preparation in economics, mathematics, or statistics is desirable but not required.
- Application to the 3-2 program is made during the junior year of the undergraduate degree program.

3-2 PROGRAM ADMISSION REQUIREMENTS

The 3-2 program requirements are the same as for the full-time M.B.A. program.

Applicants must

- have achieved outstanding scholarship in their first two and a half years of undergraduate study;
- have completed a business internship prior to commencing the M.B.A. program;
- have obtained their undergraduate department's permission to enter the 3-2 program;
- have scored well on the Graduate Management Admission Test (which they should take by January of their junior year);
- have interviewed with a member of the Simon School's Admissions Office staff.

3-2 PROGRAM CURRICULUM

Students in the 3-2 program must meet the requirements of, and take the same core courses listed for, the full-time M.B.A. program. Students are also required to pass the
management communication sequence, and the same options are available for concentrations and electives. The M.B.A. curriculum consists of nine required core courses, 11 required electives, and a management communication course sequence.

THE CORE

The core curriculum is taken during the first three quarters. Students who enter the M.B.A. program in September take the core curriculum in the fall, winter, and spring quarters. Students who enter the M.B.A. program in January take the core curriculum in the winter, spring, and summer quarters. During the first three quarters, students complete the nine required courses, one or more electives, and the management communication sequence over two quarters.

The core curriculum provides a comprehensive general business education and serves as the foundation for advanced study in selected areas of concentration. The core curriculum is comprised of the following nine courses: ACC 401, Corporate Financial Accounting; STR 401, Managerial Economics; CIS 401, Information Systems for Management; FIN 402, Capital Budgeting and Corporate Objectives; GBA 411, Framing and Analyzing Business Problems 1; GBA 412, Framing and Analyzing Business Problems 2; OMG 402, Operations Management; MKT 402, Marketing Management; and STR 403, The Economic Theory of Organizations. A three-course management communication sequence is also required.

Concentrations and Electives

Elective courses in each of the 15 areas of concentration are devoted to applying, implementing, and integrating the principles learned in earlier courses.

Although students are not required to complete a concentration, most opt for at least one, and in many cases, two. Concentrations permit students to develop expertise in the following areas:

- Accounting and Information Systems
- Business Environment and Public Policy
- Business Systems Consulting
- Competitive and Organizational Strategy
- Computers and Information Systems
- Corporate Accounting
- Electronic Commerce
- Entrepreneurship
- Finance
- Health Sciences Management
- International Management
- Marketing
- Operations Management
  —Manufacturing

—Services
- Public Accounting

Up to two courses from other schools and colleges of the University may also be taken, with M.B.A. Program Committee approval, when related closely to the student's area(s) of concentration.

APPLICATION INFORMATION

Rebekah Lewin
Director of M.B.A. Admissions
Simon Graduate School of Business
305 Schlegel Hall
University of Rochester
P.O. Box 270107
Rochester, New York 14627-0107
(585) 275-3533
admissions@simon.rochester.edu
Simon School Web site: www.simon.rochester.edu

CONCENTRATIONS

Accounting and Information Systems

In response to the automation of major accounting functions in organizations, the Simon School has designed an integrated concentration in computers and information systems and accounting which provides thorough training in both areas.

Business Environment and Public Policy

This concentration provides students with the skills to understand the economic environment in which a firm operates for business success.

Business Systems Consulting

This concentration offers a cutting-edge, highly focused program designed to equip students with the skills and experience necessary to excel in the business systems consulting enterprise.

Competitive and Organizational Strategy

This concentration focuses on business decision making in the competitive marketplace. The program is designed specifically to help students gain general management skills that can then be applied broadly within multidimensional business structures or consulting.

Computers and Information Systems

The computers and information systems concentration prepares graduates for management responsibilities in using computer systems and will enable them to provide organizations with successful management information systems.

Corporate Accounting

The corporate accounting concentration is actively recruited by corporations for positions in controllers', treasurers', and internal auditing offices, as well as in accounting departments.

Electronic Commerce

Managing in the rapidly evolving environment of Electronic Commerce requires an understanding of the technology infrastructure needed for e-commerce and the new business models that leverage on the special capabilities of the Internet. Students learn state-of-the-art tools for supporting the marketing, logistical, financial, and service-delivery aspects of doing business online. The concentration prepares students to create, manage, direct, and analyze e-commerce initiatives. Courses in this concentration combine ideas, cases, projects, and guest lectures by Internet entrepreneurs.

Entrepreneurship

The Simon School is committed to the teaching of entrepreneurship. The entrepreneurship concentration allows students to draw from a variety of carefully selected courses to become business generalists who are well versed in organizing and managing resources.

Graduates with this concentration have started their own ventures or have pursued "intrapreneurial'' careers with major corporations. Students often combine this concentration with finance or marketing to further enhance their educational base.

Finance
This concentration provides students with state-of-the-art techniques for financial analysis. Students learn to formulate and solve important corporate finance problems and learn to obtain information from the many databases on financial markets.

Health Sciences Management
The health sciences management concentration draws on the Simon School's proven strengths and directs them to a dynamic industry. The Simon School's concentration focuses primarily on two management issues: ongoing operations and strategic planning. This is in contrast to traditional Master of Public Health degree programs, which generally focus on public policy issues. The program especially suits future health sciences consultants and front-line managers in health maintenance organizations, hospitals, insurance companies, and pharmaceutical firms.

International Management
The international management concentration gives students opportunities to apply various disciplines to international markets. Differences in legal environments, currencies, and workplace practices among countries provide both challenges and problems for businesses operating in the global marketplace.

There are two options for satisfying the concentration. The first involves one required course and three electives. The second involves one required course, one elective, and one term (minimum of six credits) in an approved international exchange program.

Marketing
The marketing concentration continues to be a strong area of opportunity for graduates with an M.B.A. The concentration gives students excellent preparation for marketing research, marketing consulting, and product management.

Operations Management—Manufacturing
Operations Management—Services
Operations management is concerned with the managerial decisions by which a firm allocates and uses its physical, financial, and human resources to produce goods or services. The resurgence of interest in operational productivity has reinforced the demand for M.B.A.s with the ability to analyze resource management problems in manufacturing and service firms.

Public Accounting
The public accounting concentration offers courses necessary for sitting for the Uniform Certified Public Accounting (C.P.A.) examination in New York State and other states.

RESEARCH ACTIVITY

Research activity at the Simon School includes independent research conducted by faculty and graduate students and other studies carried out at the School's research center.

The *Bradley Policy Research Center* was established in 1966 to investigate the impact of government policy on business firms.

A complete listing of Simon School working papers is available at www.ssrn.com/link/simon-school.html.

THE BUSINESS AND GOVERNMENT INFORMATION LIBRARY

The Business and Government Information Library offers world-class resources in finance, economics, marketing, statistics, accounting, operations research, and computer information systems. Resources are offered via the library's Web site and can be accessed off campus. Articles from research journals and the business press, including news, are provided via the Web site as well as marketing reports, analyst reports, corporate financial data, and equity research materials. Services on the Web site such as chat and bulletin boards provide a way for students to ask questions and receive immediate assistance within the Web environment.

The business library is located on the second floor of Rush Rhees Library. Renovated in 2006, the space offers wi-fi, PCs, printing, and areas for group study. Library staff can assist students with locating material on the Web and in print as well as assist with citing material used in papers or slide presentations.

THE SIMON SCHOOL DEPARTMENT OF INFORMATION TECHNOLOGIES

The Simon School Department of Information Technologies (IT) provides support services to all students, faculty, and staff. The Simon IT department offers services ranging from workstation and printing support through network and e-mail services. The IT team is staffed by experienced support specialists.

The IT department and the Computing Center are located on the fourth floor of Schlegel Hall. The Computing Center is designed to support student needs with extended hours, technical support, and 30+ student-accessible workstations (Internet ready). The worksta-

tions are connected to centralized laser printers.

Although the Computing Center provides ample computing capability, students are required to own a laptop computer. Technology plays a significant role in modern business practices. It is this focus on the integration of technology into the Simon education that prepares students to enter and/or continue in the business world with technical confidence. For example, much of the M.B.A. curriculum relies on spreadsheet, word processing, and statistical applications. Also, the eventual creation and maintenance of professional quality résumés and other important documentation rely heavily on students' mastery of the productivity software that the Simon School provides.

Students may contact the Simon IT department for recommendations on hardware and software that will support the requirements of the current curriculum.

CAREER MANAGEMENT CENTER

The Career Management Center seeks to support the goals of its two primary constituencies—students and recruiters. The staff of the center possesses the expertise to provide innovative, customized services.

The Career Management Center's counseling and education staff offers targeted, personalized one-on-one counseling to assist students through the stages of executing an effective career search strategy. From self-assessment and career exploration to plan development and implementation, a dedicated and knowledgeable counselor provides support and encouragement to Simon students.

The Corporate Relations arm of Career Management actively markets the Simon product to promote awareness and secure full-time and summer internship career opportunities with leading *Fortune* 500 companies, mid- to small-sized firms, and entrepreneurial start-ups. Corporate Relations partners with alumni business professionals, faculty, staff, and students, taking an integrated lead development approach to maximize overall marketing efforts.

Together, the partnership of counseling and corporate relations activities provides a strong foundation for career success for Simon students.

COURSES OF INSTRUCTION REGULARLY OPEN TO UNDERGRADUATES

Definitive course listings are published before each semester. Courses listed here carry 4 credit hours unless otherwise noted. Following are some of the recent or planned offerings.

The following courses are offered in both day and evening sessions and are available to full- and part-time undergraduate students.

ACCOUNTING

201. Principles of Accounting. This course is an introduction to the principles and procedures used by organizations to record economic transactions that affect them, and to report the net effect of these transactions to interested external parties. The course covers the judgment inherent in certain aspects of the recording and reporting process, the acceptable alternatives for recording given transactions, and the effect these judgments and alternatives have on comparisons of the financial reports for different organizations, and on the usefulness of financial reports in general. In conjunction with this, consideration is given to the failure of financial reports to fully incorporate the economic condition of an organization and the reason for this. Not open to first-year students.

221. Cost Accounting. A study of the accounting problems involved in determining, analyzing, and controlling production and distribution costs, and income determination for financial statements. Budgetary control, standard costs, and other topics are discussed from the viewpoint of management use in planning and control. Prerequisite: ACC 201.

BEHAVIORAL SCIENCES IN INDUSTRY

241. Human Resource Management in Organizations. A survey of all aspects of human resources. Topics include strategic planning, staffing, training and development, compensation, benefits, health and safety, employee and union relations, and laws governing how organizations must treat people. Open to juniors and seniors only.

COMPUTERS AND INFORMATION SYSTEMS

215. Foundations of Management Information Systems. A survey of information system technology and its application to the various functional areas of business. Topics include a complete overview of computer hardware and software, introduction to systems analysis, database management systems, data communications, system development and acquisition, management of computing, and analysis of the strategic considerations of information systems for business. Prerequisite: one of EE 171, OPT 105, CSC 108, CSC 171, CSC 181, or any 200-level CSC course.

225. Data Management. An in-depth study of data management, data processing, and database techniques. Topics include input and output processing; data structures; sequential, direct, and indexed access methods; report generation; and theory and practice of database management systems. A high-level data processing language (COBOL) is used by students for file processing. The design, oper-ation, and management of database systems are practiced using a relational database
product Microsoft ACCESS and SQL. Prerequisite: CIS 215.

FINANCE

205. Financial Management. This course centers on how a firm is funded, and on how financial management can help maximize the financial rewards to those who own the firm, while meeting the obligations of the firm to other stakeholders. The effect of timing on the value of cash flows is developed at length and is applied to the valuation of bonds and stocks. Various facets of stocks and bonds are also introduced, and a brief overview of the stock market is presented. Cash flow concepts are then incorporated into a development of how investment opportunities are analyzed, which includes a discussion of the strengths and weaknesses associated with different analytical methods. The topics of capital market efficiency and portfolio theory are then discussed and tied into the concept of what investors have sacrificed in order to invest in a firm. This, in turn, is tied into which investments are worthwhile to a firm's owners. The course then centers on a discussion of how firms use debt and equity to raise funds, and on the costs and benefits of funding the firm by simply keeping earnings within the firm instead of distributing them to stockholders. Prerequisites: ACC 201; ECO 207 or equivalent.
206. Investments. This course covers various aspects of investments. Financial securities are discussed, along with the markets in which these securities trade. Investment in these and other financial instruments via mutual funds is examined, as is the market implications of combining financial investments into portfolios. The capital asset pricing model is developed, and topics such as arbitrage pricing theory, multifactor risk models and behavioral finance are also surveyed. The concept of efficient capital markets is covered, along with anomalies that arise regarding the efficient markets hypothesis. Debt securities and the management of debt portfolios are explored, as is equity valuation. In addition, financial derivatives such as options futures and swaps are studied in detail.

GENERAL BUSINESS ADMINISTRATION

257. Fundamentals of Business Administration. An introduction to the principles of business, examining a wide range of problems businesses face today, using commercial successes and failures. The issues include how companies should consider identifying the markets for their products, leadership and motivation of employees, fund raising considerations and ethical issues facing business men and women. The class concludes with small group presentations and presentation of a modified business plan which integrates information studied during the semester.
291. Reading Course. Independent study in some specific area of business administration, at a level advanced beyond that of regular course offerings. Prerequisite: written approval of the supervising faculty member.

LAW

205. Business Law. A study of basic principles in several fields of law of significance to businesses and other organizations, including constitutional law, contracts, and the legal structure of the major forms of domestic business enterprises. This is preceded by a review of certain environmental and historical aspects of the law, including the legal processes by which our laws are created, and the functions of the courts. Throughout, the emphasis is on developing an understanding of the reasoning process used by the courts to resolve disputes and define new law. Open to juniors and seniors only.

MARKETING

203. Marketing. Understanding customerís wants and needs and how the marketing function goes about developing products and services to meet those needs on a continuous basis and optimizing customer satisfaction as an end result. A detailed analysis and knowledge with regard to the basic marketing functions and the various marketing functions performed by marketing intermediaries—manufacturers, retailers, wholesalers, agents, and others in the channel of distribution. Evaluation and discussion on key marketing topics: pricing, branding, promotion, channels of distribution, new products and services development, and the creation of advertising and sales promotion programs to create consumer awareness with regard to those products and services. Culminates in a basic fundamental understanding and working knowledge of the marketing function within the firm. Not open to first-year students.
213. Marketing Projects and Cases. This course involves working with local firms and organizations on a current marketing program or product that the firm is about to develop and launch. Involves work with a local organization on a "team basis" for approximately three and a half months culminating with a formal presentation to the key personnel within the firm/organization along with a written document that covers research, assessment, conclusions, and recommendations. Student acts in a "Marketing Consultant" mode with the firm/organization being the "Client/Customer." Also included are guest speakers, cases studies, lectures, and selective readings in marketing. Includes involvement in an applications situation utilizing the various marketing concepts and principles studied in the Principles of Marketing course MKT 203.

OPERATIONS MANAGEMENT

231. Operations Management. The course discusses problems encountered in managing the production of goods and services, and models and techniques for dealing with these problems. Emphasis is on developing analytic insight into selected models which have proved useful. Topics include process flow analysis, queuing theory, inventory control, and recent innovations in production management. Reading *The Goal* by Goldratt, case discussions, simulations, and videos are used to gain practical insights into the operations function. Not open to first-year students.

Margaret Warner Graduate School of

Education & Human Development

Raffaella Borasi, Ph.D. (SUNY, Buffalo) *Dean*

THE WARNER MISSION

At the Margaret Warner Graduate School of Education and Human Development, we believe that education can transform lives and make the world more just and humane. This vision informs our teaching, research, and service as a research school of education, as we strive to

- PREPARE practitioners and researchers who are knowledgeable, reflective, skilled, and caring educators, who can make a difference in individual lives as well as their fields, and who are leaders and agents of change
- GENERATE and disseminate knowledge leading to new understandings of education and human development, on which more effective educational policies and practices can be grounded
- COLLABORATE—across disciplines, professions, and constituencies—to promote change that can significantly improve education and support positive human development.

Our diverse work in each of these domains is informed by the following underlying beliefs: the improvement of education is in pursuit of social justice; development and learning shape and are shaped by the contexts in which they occur; the complexity of educational problems requires an interdisciplinary and collaborative approach; and best practices are grounded in research and theory, just as useful theory and research are informed by practice.

PROGRAMS

The Warner School offers master's and doctoral degree programs that may be of interest to undergraduates considering graduate work in education and human development. Students are encouraged to take courses in these programs as undergraduates, both to explore the interesting intellectual and career opportunities available in education and to possibly get a "jump start" on graduate work. Many undergraduates apply to Warner programs in teaching and curriculum, counseling, human development, higher education, and educational policy in their senior year.

Teaching and Curriculum

The Warner School offers a Master of Science (M.S.) in Education and New York State teaching certification for those interested in teaching at the following levels: Early Childhood (birth–grade 2), Childhood (grades 1–6), Middle Childhood (grades 5–9), Adolescence (grades 7–12), and Middle Childhood and Adolescence (grade 5–12). Programs in Early Childhood and Childhood prepare to teach all subject matters, while secondary programs require specialization in one (or more) of the following subject matters: English, mathematics, social studies, biology, chemistry, physics, earth science, French, Spanish, German, or Latin. Programs for those interested in Teaching English to Speakers of Other Languages (grades K–12), Teaching Students with Disabilities, and Reading and Literacies (at either birth to grade 6 or grades 5–12) are also available. In addition, the Warner School offers the Master of Arts in Teaching (M.A.T.), which combines secondary (grades 7–12) teacher preparation coursework with advanced work at the College

in the subject area of specialization.

At the doctoral level, the Teaching and Curriculum department offers a Doctor of Education (Ed.D.) in Teaching and Curriculum and a Doctor of Philosophy (Ph.D.) in Education, with a concentration in teaching, curriculum, and change.

Counseling and Human Development
The Warner School offers Master of Science (M.S.) degrees in the areas of human development, school counseling, and community mental health counseling. For those who are interested in working with special populations, we recommend that you tailor electives and internships to further those interests. At the doctoral level, the following are offered: the Doctor of Education (Ed.D.) in Mental Health Counseling or Counseling and Human Development, with a concentration in either counseling or human development; and the Doctor of Philosophy (Ph.D.) in Education, with a concentration in human development in educational contexts or counseling and counselor education.

Educational Leadership
Educational Leadership offers programs in higher education, school leadership, and educational policy. The Master of Science (M.S.) degree in Educational Administration is offered with a concentration in K–12 school administration, higher education, and higher education student affairs. At the doctoral level, the Doctor of Education (Ed.D.) in Educational Administration is offered with a concentration in K–12 school administration or higher education, and the Doctor of Philosophy (Ph.D.) in Education is offered with a concentration in educational policy and theory or higher education.

PERSPECTIVES ON EDUCATION FOR UNDERGRADUATES

While the University does not offer a bachelor's program in education, undergraduates interested in education and human development—and the many issues related to schools, socialization, learning, and growth—are encouraged to take courses at the Warner School. Issues such as the relations among race, gender, language, ethnicity, class, disability, and schooling; the uses of technology as teaching and learning tools; the application of sociocultural theory and research to human learning and development; the ties among economic, social, and educational practices and policies; and other matters of significance to contemporary society may be studied at the Warner School. Warner courses may complement undergraduate programs in the College and/or offer undergraduates the opportunity to explore new intellectual areas and career opportunities in the educating professions. It may even be possible to begin studies for specific careers at the Warner School as an undergraduate. Students who are interested in a career in education are encouraged to meet with a Warner admissions counselor to learn more about Warner's programs and opportunities for coursework as an undergraduate. The Office of Admissions offers day and evening appointments for student counseling and school tours. The Warner School is located in Dewey Hall on the Eastman Quadrangle opposite Lattimore Hall. Contact Admissions at (585) 275-3950 or visit us on the Web at www.rochester.edu/warner.

Teacher Preparation
Due to changes in the New York State teacher certification requirements, the Warner School no longer has a teacher education program at the bachelor's level. Undergraduates interested in a career in teaching are encouraged to take courses at Warner and seek classroom experience to help get a head start on a graduate program in their area of interest. Starting teacher education coursework as an undergraduate provides students with the opportunity to explore and better understand the teaching profession and can allow for the completion of a master's degree and New York State certification in one additional year of study. In most cases, initial and professional teacher certification is offered through 15 months of postgraduate study and is offered at the early childhood and elementary levels; in English, mathematics, Latin, French, Spanish, German, biology, chemistry, physics, earth science, and social studies at the secondary level; and in Teaching English to Students of Other Languages in grades K–12 and Reading and Literacies.

Students considering a career in teaching are also encouraged to complete all subject area requirements at the undergraduate level. New York State specifies the number of hours in various subjects required for certification (usually about 30 undergraduate credits in the subject of specialization, but there are some variations so make sure you check), including two college-level semesters of one foreign language (ASL is also acceptable). Consult with a counselor in the Warner School Admissions Office, (585) 275-3950, for exact requirements for the specialization you are considering.

Fifth Year in Teaching Program/Urban Teaching and Leadership Program
The University of Rochester recognizes the critical need for teachers of traditionally marginalized students and through the Warner School of Education offers a unique program to encourage its undergraduates from diverse backgrounds and subject areas experiencing shortages to enter the teaching profession and be prepared to teach in urban settings. The Fifth Year in Teaching Scholarship provides a limited number of awards for full tuition for graduate study to University of Rochester undergraduates who apply to the Warner School during their senior year to become teachers in urban settings. Successful applicants are accepted into the Urban Teaching and Leadership Program (UTL), where they will complete a Master of Science (M.S.) or Master of Arts in Teaching (M.A.T.) degree and two years of teaching in an urban school. The UTL program combines the theory, practice, and activism to help candidates develop the knowledge, skills, and dispositions required to become effective advocates for urban students and their families. The goal of the UTL

program is to prepare urban educators who have the courage and conviction to lead struggles for social justice, in-depth knowledge of the subjects they teach, and the skills and understanding needed to help all students develop to their fullest potential.

The Fifth Year in Teaching Scholarship has been designed to help the Warner School address the needs of urban schools by encouraging qualified University of Rochester undergraduates to become skilled teachers in urban areas. Recipients of the award will include individuals who are able to increase the diversity of the urban teacher population or increase the number of certified teachers in specializations where there are the highest shortages in the Rochester area.

These scholarships cover full tuition as well as on-campus room and board for students who prove financial need (some restrictions apply). Students who are not eligible for free room and board can obtain a forgivable loan to cover the cost of on-campus room and board. Upon acceptance of the Fifth Year in Teaching Scholarship, candidates make a commitment to successfully obtain their master's degree from the Warner School, become certified to teach by the NYS Department of Education, and to teach in an urban school for two complete academic years following graduations. Please visit www.rochester.edu/Warner/admissions/finaid/fifthyear.html for eligibility criteria and details.

Robert Noyce Scholarships
The Warner School offers a new scholarship opportunity for science, technology, engineering, and mathematics (STEM) majors to become effective science and mathematics teachers and to expand the number of highly qualified teachers serving high-need school districts. Noyce scholars attend the Warner School's teacher preparation program effectively tuition free. The program, which awards scholarships to up to 10 students per academic year (through 2010) who have a degree in math or science, provides an incentive for talented undergraduates to work as math and science teachers in high-need school districts. All Noyce scholars participate in Warner's high-quality, innovative teacher preparation programs leading to teaching certification in mathematics, biology, chemistry, physics, or earth science. Noyce scholars commit to teach in a high-need school for at least two years following their graduation.

The Combined Undergraduate and Graduate Programs in Counseling and Human Development
The combined undergraduate and graduate programs in counseling and human development offer an opportunity to qualified University of Rochester undergraduate students to begin graduate study toward the Master of Science (M.S.) degree during their senior year. The master's program in human development can be completed after one year of postgraduate study. The school counseling program, which leads to New York State certification as a school counselor, takes about two years of postgraduate study. The program in community mental health counseling, which leads to New York State licensure in mental health counseling, also can be completed in about two additional years.

In the first year of a combined program, students who are in their senior year and are simultaneously enrolled in the master's degree program finish their undergraduate work and receive the bachelor's degree in their undergraduate concentration at the end of the senior year. In the human development program, they must complete a minimum of 15 credit hours of graduate coursework in their senior year, which can also be counted toward their undergraduate degree, and then an additional 30 credits of graduate coursework in human development (for a total of 45 credit hours). For the counseling programs, graduate coursework only goes toward the graduate degree, not the undergraduate degree, and must total at least 48 credit hours for students specializing in school counseling and 60 credit hours for students specializing in community mental health counseling. A master's capstone project and, in the case of the counseling programs, internships are required. Applications for the combined programs must be completed no later than spring semester of the junior year. Admission requires that the student's undergraduate concentration will be completed by the end of the junior year or assurance from the concentration department that the requirement for the bachelor's degree will be met by the end of the senior year. Early inquiry is encouraged, especially from sophomores and first-semester juniors.

Higher Education
The Warner School's programs in higher education prepare thoughtful administrators and researchers for positions at post-secondary institutions, in government, and in many organizations that work with and for colleges and universities. A specialization in higher education, student affairs offers students an opportunity to combine practical leadership experience in student affairs with a dynamic academic program. Undergraduates are encouraged to take courses in higher education to complement their student leadership experience, explore the field of higher education administration, and possibly get a head start on a master's program in the field.

The Guaranteed Rochester Accelerated Degree in Education
The Guaranteed Rochester Accelerated Degree in Education (GRADE) is a five-year B.A./B.S. + M.S. education program for undergraduate students admitted to the University of Rochester who are interested in becoming educators (six years if pursuing a specialization in counseling). GRADE students enter the University with an assurance of admission to the Warner School (provided that they meet the prerequisites for their selected area of specialization by the time they complete their undergraduate degree) with the Steven Harrison quarter tuition scholarship for the duration of the program. The program is designed to offer students a quality liberal arts education while also preparing them to become educators. If you have already been admitted as a GRADE student,

please contact your advisor to discuss how you can best maximize the program.

COURSES OF INSTRUCTION

Definitive course listings and complete descriptions are published before each semester and are available on the Warner Web site at www.rochester.edu/warner. Courses listed here carry 3 graduate credit hours unless otherwise noted.

The following courses are among those available to undergraduates. Students interested in pursuing a future degree from the Warner School and who hope to take courses that will count toward these programs are encouraged to consult with a counselor in the Office of Admissions at (585) 275-3950 to ensure appropriateness for the program of interest. Please note that the successful completion of coursework does not guarantee admission to Warner programs, and final decisions about transfer credits can only be made at the time the student's "program of study" is approved.

With the approval of students' undergraduate academic advisors and the Warner School registrar, students are welcome to take additional introductory graduate courses (400 level).

ED 410. History of American Education. Explores education broadly as the formal or conscious transmission of culture in family life, colleges, peer groups, youth agencies, religious and cultural organizations, and the media. Investigates the processes of cultural transmission across four centuries of American history, beginning in the mid-1600s, but the major emphasis is on post-1900 themes.

ED 411. Philosophy of Education. Examines a range of contemporary controversies and historically influential philosophical theories of education as a vehicle for critical reflection on the political, moral, epistemic, and linguistic aspects of educational practice.

ED 412. Sociology of Education. Integrates sociological theory, policy studies, and contextual applications in respect to education, schools, communities, and professional practices.

ED 415. Adolescent Development and Youth Culture. (Ages 10 to 20.) Develops an understanding of what it means to be an adolescent in present day American culture. Explores adolescent development as an integral part of lifespan development, employing cultural, psychological, social, and biological perspectives.

ED 418. The Family and Social Dynamics. Introduces the basic dimensions and dynamics of the family as a social institution and as a significant context for individual development.

ED 419. Life Course Studies. Examines the popular myths and misunderstandings about aging and the life course by critically surveying existing scholarly knowledge, research, and theory about the life course and examining how the individual's biographical experience and view of his or her personal past and future are shaped both by societal institutions and by interpersonal expectations.

ED 425. Minority Youth Development in Urban Contexts. Provides an exploration of developmental and sociocultural processes that impact long-term outcomes for minority students. Influential environmental issues are examined that focus on cultural, educational, structural, and sociopolitical factors.

ED 428. Ethics and Education. Explores the moral dimensions of education and educational leadership in K–12 and higher education settings. Examines a range of ethical problems associated with educational institutions and the moral dimensions of educational leadership.

ED 429. Theories of Human Development. Provides a comprehensive introduction to multidisciplinary approaches to human development within the behavioral and social sciences. Explores theories of human development and the process of individual change over time that occurs in social, cultural, and historical contexts.

EDU 442. Race, Class, Gender, and Disability in American Education. Prepares students to better understand diversity issues, with the ultimate goal of eliminating existing practices of exclusion and inequality in schools and society. Surveys and critically analyzes literature on diversity, and encourages candidates to examine their own positions of identity, including race and ethnicity, class, gender and sexual orientation, language, religious belief, age, and ability and the consequences of these identity positions on teaching and learning in diverse settings.

EDU 446. Entrepreneurial Skills for Educators. Engages students in the development of skills and practices that make traditional entrepreneurs successful and examines how these practices can empower educators to be more effective leaders and agents of change.

EDU 455. Policy and Practice in Developmental Differences. Oriented by a developmental, lifelong, and multidisciplinary approach, participants work to dispute dominant disability discourses of "lacks and absences" and to reconsider developmental differences as neither inherent nor "less than" what is needed.

EDU 464. Child Development and Learning in Context. (Ages 5 to 12.) Develops an understanding of what can be expected of children 5 to 12 years old. Examines the development of children from theoretical and empirical perspectives, emphasizing the role of a wide range of contextual factors in children's development.

EDU 467. Language, Literacy, and Cognitive Development. Develops an understanding of how children develop oral communication, reading, writing, and other literacy skills, and how this development can be supported and enhanced.

ED 476. Administration of Student Affairs in Higher Education. Introduces the history, philosophy, and purposes of student affairs and student services administration. Examines the theoretical and practical foundations of the student affairs profession.

ED 483. Communication and Counseling Skills for Teachers, Administrators, and Other Helping Professionals. Introduces the educating or allied helping professional to the basic skills and core perspectives of counseling as a form of communications.
ED 485. College Students and Student Development Theory. Explores psychosocial, cognitive-structural, identity, and typology theories of college student development.
EDU 485. College Access and (in)Equity. Addresses theories and research on a variety of issues related to college preparation, school structures, and inequalities in college access.
EDU 492. Governance, Policy, and Administration of Higher Education. Examines the organization and governance of American higher education institutions, giving due weight to the context in which trustees, presidents, academic administrators, and faculty members make decisions.
EDU 493. History of Higher Education. Provides a historical survey of and examines critical issues in the evolution of American higher education, beginning in the colonial era and extending to the present.
EDU 494. Human Development in Old Age. Examines aging as dynamic complexes shaped by sociocultural, political processes that include issues of gender, ethnicity, social status, life experiences, sexual orientations, and health/illness.
EDU 498. Literacy Learning as Social Practice. Develops an understanding of the social nature of language and literacy practices in and out of school. Examines theories of literacy learning and learning more generally, also addressing current debates in the field of literacy.

Academic Services & Information

This section is specifically for undergraduate students in the College. Please see pages 161–162 for policies concerning the School of Nursing.

ACADEMIC SUPPORT SERVICES

In addition to consulting their assigned advisors, all undergraduate students in the College are strongly encouraged to use the services of the College Center for Academic Support throughout their college careers. The professional advisors in this office assist students in arranging their programs, suggesting courses, obtaining faculty advisors, and making the unavoidable paperwork as simple as possible. Questions concerning the Rochester Curriculum, certificate programs, the "Take Five" Scholars Program, the Key Program, interdepartmental studies, and many other majors will be answered. The University Tutoring Program Office and Orientation Program Office are located in the Center in Lattimore Hall. Immediately adjacent to the Center in 312 Lattimore the Academic Services Counter serves as a focal point for satisfying quickly many routine academic inquiries, for dropping and adding courses, for making immediate appointments or walk-in arrangements to see an academic advisor, and for providing fast referrals to other offices.

The Edmund A. Hajim School of Engineering and Applied Sciences offers additional academic advising through a faculty advising system and the School's Dean's Office in 306 Lattimore Hall.

The Margaret Warner Graduate School of Education and Human Development offers advising and information assistance related to programs in education through its Student Services, 2-161 Dewey Hall, and through faculty of the school.

For School of Nursing student support
serv-ices, please contact the school's Student Affairs Office, (585) 275-2375.

PROGRAM PLANNING

One of the University's goals is to help undergraduates plan an integrated program of study which will provide intellectual satisfaction and challenge. Program planning with the help of pre-major advisors begins during Orientation and continues throughout a student's academic career at Rochester. Discussions with pre-major and professional staff advisors are useful in working out a schedule of courses for a particular semester as well as an overall plan for future semesters. Many special serv-ices designed to assist undergraduate students are described below.

PRE-MAJOR ADVISORS

Students interested in degree programs in arts and sciences work extensively with a pre-major advisor until the end of the sophomore year, or earlier if accepted into a major. They consult with their advisors when they register for courses and consider dropping or adding any courses. After being admitted to a major, students are assigned faculty advisors in the area of their majors.

Students interested in degree programs in the Hajim School of Engineering and Applied Sciences have faculty advisors from the desired majors assigned to them at the beginning of the first year and are encouraged to consult with them frequently. These faculty will remain as the students' advisors until graduation, unless a student changes majors or is reclassified to another graduating class.

PROGRAM PLANNING WORKSHOPS

During Orientation, just prior to the start of classes in the fall, faculty members representing all academic areas in the College are on hand to assist new students in choosing courses and completing their registration. In November and in April, during the registration period, students already enrolled who have financial clearance from the bursar select their courses with the help of their advisors and register online for the following semester. Each semester, just prior to registration, the College Center for Academic Support coordinates advising-related events where students may obtain help in planning programs, clusters, majors, minors, and sorting out the ways in which their academic goals may be fulfilled.

REGISTRATION

Entering students register for their courses online before and during Orientation, scheduled during the week prior to the start of classes. Returning students who have received financial clearance from the bursar may register online during regular registration periods. A person is not considered a student until registered.

Students who have not received financial clearance before the registration periods will forfeit their priority for course selection and lose the opportunity to participate in the room drawing procedure for on-campus housing.

In cases where students settle their accounts after the registration period, the bursar's office will notify the registrar's office that the student is cleared for registration. Cleared students may then register and apply for on-campus housing. Should accounts remain unsettled at the end of the term, the bursar's office will refer such cases to the dean of the student's college for withdrawal for financial reasons.

UNIVERSITY TUTORING PROGRAM

The University Tutoring Program is administered through the College Center for Academic Support. This service offers, through a carefully selected group of tutors, supplementary tutorial assistance to students based on their individual needs. The tutor's role is to help provide the student with a better understanding of the subject and to help discover and remedy the cause of the difficulty.

Students interested in tutorial assistance should apply at the College Center for Academic Support. Financial help to those students needing it may be arranged upon recommendation of the Financial Aid Office.

Only tutors approved by the University Tutoring Program are paid for their services. Students wanting to become tutors are welcome to apply at that office.

STUDY SKILLS COUNSELING

Counselors in Learning Assistance Services, 107 Lattimore Hall, offer help in study skills and math by talking with students individually and helping them to develop strategies for studying more effectively and efficiently. Tutors in the College Writing Center, Rush Rhees Library, Room G-121, help students to examine their written work, correct problems, and make appropriate revisions (see page 181).

COURSE DEFINITION

The ordinary unit of undergraduate instruction is the course. Many courses numbered between 100 and 399 carry the equivalent of four hours of credit. Every four-hour course requires approximately one-fourth of the student's working time for one term. Restrictions concerning prerequisites and approval required are noted in each semester's schedule of courses and must be observed carefully. In some cases, special forms are required and may be obtained in the appropriate advising offices.

PROGRAM OF COURSES

A normal schedule for regularly enrolled students in the College is four 4-credit courses per semester. This permits completion of the 32 courses (128 credit hours) required for graduation in eight semesters. Full-time students are expected to take four years for the degree. A few accelerate. Others occasionally find it necessary to make up work during the summer. Taking extra credits is not considered a means of speeding up the timetable for attaining a degree, but rather a means for enriching an academic program. Only students with a "B" average or better in one semester are permitted to take more than 19 credit hours during the next semester. This is referred to as an "overload." First-semester freshmen are not permitted to take more than 3 credit hours over their four regular courses. For full-time students, fewer than 14 credit hours is termed an "underload," and enrollment in at least 12 credit hours is required. Both overload and underload programs must be approved by the student's dean, normally through the College Center for Academic Support. If credits in excess of the standard four-course load are used to accelerate, a retroactive tuition adjustment will be assessed for all credits in excess of the normal 16-hour course load per semester counting towards degree requirements. The assessment is generally made in the student's final semester. Additional financial aid resources are not available.

College Course Numbering System

001–099 Noncredit courses*
100–199 Introductory courses—usually at the first- and second-year level;

no graduate credit

200–299 Courses at the third- and fourth-year level that may also carry graduate credit

300 Study abroad

301–399 Experimental courses, independent courses, courses toward degree with distinction or honors

400–489 Graduate courses at the master's level or the first year of graduate study; open to undergraduates by special permission

490–499 Master's-level reading or research courses

500–589 Advanced or specialized graduate courses—usually at the doctoral level

590–599 Doctoral-level reading or research courses

CLASS ATTENDANCE

Each instructor sets the regulations regarding attendance for each class; many do not make class attendance mandatory. But, consistent absence from class may determine whether or not students pass a course. When it is necessary to be absent because of travel or illness, students are expected to make arrangements with instructors for catching up on class work they miss.

If a student has been seen by a University Health Service provider during the course of an illness, the UHS will be able to document the knowledge of the illness that restricts activity. Services provided by the University Counseling Center will not be documented in any way for purposes related to class attendance.

SPECIAL ACADEMIC OPPORTUNITIES

Students are encouraged to take courses for which they are qualified wherever the courses are offered at the University of Rochester to fulfill academic goals. Admission to certain courses requires special permission. Usually, this means permission of the instructor, whose signature is then required on the registration form. Special requirements must be met in the following instances:

Affiliated Area College Courses. In the College, students who wish to take a course at one of the area colleges in order to complement their programs of study may obtain information and registration forms at the College Center for Academic Support. Grades received in approved courses are noted on the transcript, but are not used in computing the grade-point average. Transfer credit is granted for courses passed with a grade of "C" or better.

Applied Music Courses at the Eastman School of Music. Students desiring to enroll in one of these courses should consult the Music Advisor on the River Campus. Application forms for applied music courses are available from the Music Office, Todd Union.

Audited Courses. If a student plans to participate in class sessions and work without earning a grade for a course, and without earning credit toward a degree, the course may be included in the class schedule at the time of registration. There is no extra cost for matriculated full-time students, but permission of the instructor is necessary. The audited course will not appear on the transcript.

Graduate Courses. Qualified undergraduates may, with the written permission of the instructor and the approval of their dean, register for graduate-level courses.

Honors Seminars. Special application is required in some cases. Courses and restrictions are listed in the schedule of courses.

Independent Study Courses. Formal arrangements must be made with appropriate faculty members for these special reading or research courses. An Independent Studies Form is submitted to the College Center for Academic Support at the beginning of the semester. Students are eligible to apply for a one 4-credit-hour independent study course each semester. Independent study courses required specifically for a major are listed under departmental offerings. Internships provide another kind of independent study.

Internships. In the College, these off-campus learning experiences require that arrangements for academic credit be made by the end of the third week of the semester. A maximum of eight hours of credit for Rochester-area internships may count toward the degree. Students who obtain approval from the Internship Com-mittee for work outside the Rochester area may receive as much as a full semester's credit toward their degree. Admission to some programs is highly selective. Questions should be addressed to the College Center for Academic Support in 312 Lattimore Hall.

The Hajim School of Engineering and Applied Sciences cooperates with private industry to provide several internships to selected undergraduates. Interns are paid for their work experience and thus do not receive academic credit. However, written evaluations of the work experience, both by the student and the employer, in some cases, do become part of the intern's academic record. Students receive information concerning these opportunities as they become available.

Quest Courses. These courses, meant primarily for students in their first two years, are shaped by the practices of faculty learning. They embody a research-based pedagogy, and exemplify research as a way of learning. Quest courses are normally small, exploratory, and research-oriented. They emphasize conversation and collaboration, and feature the perspective of a second look. Quest courses can be library-, data-, or laboratory-intensive, and emphasize the skills that benefit the process of investigation. Freshmen, who have priority, are given the opportunity to register for fall courses during Orientation.

Study Abroad. Information about the various programs sponsored by the University of Rochester and about other opportunities for

study abroad is available in the Center for Study Abroad and Interdepartmental Programs in Lattimore Hall. (See page 8.)

Summer School Courses. Day and evening courses in a variety of fields are offered in several sessions each summer at the University. Grades earned in these courses are calculated into the cumulative grade-point average, and credit toward the degree is awarded for courses in which passing grades are earned. Students also may take advantage of special opportunities to study abroad on one of Rochester's programs. Credit for summer study at other institutions may require approval from the department offering comparable work at the University of Rochester. Approved summer work at other institutions completed with a grade of "C" or better is recorded in terms of course credit, but the grades are not used in computing the student's cumulative average. Further information and approval forms are available at the College Center for Academic Support.

Double Majors
Students enrolled in the College may choose to pursue two majors leading to the Bachelor of Arts degree. In most instances students may do so by fulfilling concurrently the requirements determined by each of the two departments and by receiving written permission (usually on the declaration forms) from the respective major advisors to pursue a double major in the other area. Questions concerning double majors, including course overlap policies, can be addressed to the College Center for Academic Support and the appropriate major advisors.

Double Degrees
Students who plan a program leading to more than one baccalaureate degree, such as the Bachelor of Arts and a Bachelor of Science, are required to meet all requirements for each degree plus an additional 8 credits and to receive approval for pursuit of these degrees from the Administrative Committee of the College. Students who wish to complete work in two areas as part of a single degree need only obtain approval for each major and for the double major (see Double Majors above). The requirements for double degrees within the Hajim School of Engineering and Applied Sciences are specified on page 135.

Students interested in pursuing a Bachelor of Music degree offered by the Eastman School of Music while also pursuing a Bachelor of Arts or Bachelor of Science degree offered by the Col-lege need to be accepted separately through each office of admissions.

Minors
Students may choose to minor in one or more of the several dozen areas available to them (see list of minors, page 10). Students are eligible to declare a minor after they have been accepted into a major and before the end of the first semester of their senior year course overlap policies apply.

ACADEMIC PROCEDURES
Full-time students are subject to the following regulations. Part-time students should check with their college of enrollment for any variations in regulations.

Course Changes
Students register for their courses online during registration or at Orientation, as described earlier. They may later change their programs and withdraw from a course, add a course, or drop one course and substitute another. These changes are made online or on a drop-add form that may be obtained from the Center for Academic Support until the deadline for the particular action, as described below.

Students in the College may add independent study courses through the third week, and other courses through the fourth week, with the instructor's written approval. They may drop them and have them deleted from the record through the fourth week. Students may withdraw from courses through the last day of the 11th week of the semester, providing the instructor has been informed. For freshmen and sophomores who have not been formally accepted into a major, the authorization of the pre-major advisor is needed for every add, drop, or withdrawal action. Courses from which students have withdrawn will appear on their transcripts with the "grade" of "W." The advising record will show in addition the week of the semester in which the course was withdrawn.

Students in the Hajim School of Engineering and Applied Sciences may add and/or drop a course during the first four weeks of each semester. The permission of the faculty advisor and the associate dean are required for add and drop transactions.

For all students, course changes can be made only if the deadlines are met, if the instructors of the added courses approve, and if the change meets the provisions outlined earlier for overload or underload schedules.

Student Petitions
The faculty of the College establishes all degree requirements. The faculty recognizes that there are instances in which interpretations are required and exceptions should be made. The Administrative Committee, comprising both faculty and students, reviews requests for exceptions to faculty regulations.

Students seeking exceptions to regulations submit a written petition to the College Center for Academic Support or their dean's office for review by the appropriate committee. It is an advantage to discuss the content of the petition with a faculty or academic advisor before submitting the petition. Students will be informed in writing of the committee's action.

Satisfactory-Fail Option

Undergraduate students in the College are encouraged to venture outside areas of their major, investigate new disciplines, and discover new, perhaps unsuspected, interests. The satisfactory-fail option may reduce anxiety about electing a course in an area in which the student has had little or no prior experience.

Students enrolled in the College may elect to take one course per semester up to a maximum of eight courses and receive grades of Satisfactory (S) or Fail (F). The grades "S" and "F" do not affect the cumulative grade-point average.

Instructors assign and submit regular letter grades for students choosing this option, as they are not informed which students have elected the option. The registrar records "S" for letter grades "A" through "D–" or "F" for the letter grade "E" on the student's permanent record, retaining the letter grades "A" through "E" on file. Students who are interested in conveying maximum information on the transcript to professional and graduate schools should speak to an advisor prior to electing the option.

Students enrolled in the College may declare the option in the College Center for Academic Support through the 11th week of classes (the same deadline as for withdrawing from courses) and, except for first-semester freshmen and transfer students in their first semester who may change or declare the option through the 13th week of the semester, the option may not be changed. The option is not available in summer.

Students pursuing degrees in the College may not elect this option for courses used to fulfill College, major, minor, or cluster requirements.

Students planning degrees from engineering and applied sciences should note that courses taken with the satisfactory-fail option may not be used to fulfill department requirements or cluster courses. These courses may be used to fulfill additional humanities or social sciences requirements or for free electives for an engineering degree. Otherwise, only courses taken beyond those required for a degree may be taken with the option.

Incompletes

A grade of "I" should be given only when there are circumstances beyond the student's control, such as illness or personal emergency, that prevented the student from finishing the coursework on time. Under no circumstances may the "I" be given for the following situations:

• student who wishes to do additional work after the course deadline to improve a grade
• student who wishes to redo the course work in a subsequent semester to improve the current grade.

A form requesting a grade of "Incomplete," indicating the work outstanding and the deadline for its completion, must be signed by both the student and the instructor and submitted to the College Center for Academic Support. There is a one-semester limit for completion of the course, unless the College permits an extension. (Extensions are routinely granted when students are expected to complete their work by attending the course the next time it is offered, if the course is taught only once a year.)

Once a final grade has been submitted, whether passing or failing, the grade of "I" will be removed from the transcript. The grade of "I," however, will continue to appear on the advising record. The instructor may request a waiver of the recording of the "I" on the advising record when the lateness was created by circumstances unrelated to the student, such as equipment failure in a laboratory.

The student's failure to submit the form or to complete the work by the deadline will result in an "E" for the course, unless the instructor noted on the form that a different grade should be assigned. The dean of the College shall inform the student of an impending action to change the "I" grade before notifying the -registrar.

Repeating a Course for a Grade

There are times when students wish to demonstrate on their official record that they understand the material better than their grades indicate. Many complex issues are often involved, and students need to be sure that they have considered all of their options before making their decision to repeat a course. For these reasons, students who want to repeat a course need to secure the dean's approval by meeting with a professional advisor in the Center for Academic Support. When a course is repeated at Rochester for a grade, both course registrations and both grades appear on the transcript, but only the second (not necessarily the better) grade is used to calculate the grade-point average. Credit may be earned for a course only once.

Senior Year *in Absentia*

Students in the College expecting degrees in arts and sciences and who are admitted to a professional or graduate school at the end of their junior year may be eligible to spend their senior year *in absentia*. All college and major requirements should be completed by the end of the junior year. Those students considering a senior year *in absentia* should discuss the possibility in the College Cen-

ter for Academic Support and petition the Administrative Committee for approval. If *in absentia* status is approved, the student will earn a baccalaureate degree from the University of Rochester following successful completion of the first year in the graduate or professional program. Students who have spent their junior year abroad will not receive approval to spend the senior year *in absentia*.

Because a student's most advanced work can be done in the senior year, students expecting degrees in engineering and applied sciences are not encouraged to take that year *in absentia.* Students interested in attending other colleges as special students or in beginning medical or law school early should consult their faculty advisors.

Withdrawal and Inactive Status

Students who contemplate withdrawal from the University should consult an advisor in the College Center for Academic Support or their school's dean's office.

Students wishing to spend a semester or more away from the University to work, to travel, or to study at another institution may apply for "inactive" status in the College Center for Academic Support or their school's dean's office. Those students who are placed on inactive status pay a nominal fee and receive registration materials. Housing priority is assigned in accordance with their classification.

Students holding residence halls contracts who withdraw or are withdrawn from the University for any reason should be aware that their residence hall contracts are automatically cancelled upon receipt of a withdrawal notice from the appropriate advising offices. Withdrawn students have no further claim to their assigned space. Students who are officially reinstated and who wish to live in the residence halls must submit a new contract, and they will be placed on a space-available basis. These conditions also apply to students *in absentia*, Study Abroad or in internship programs, and students going on inactive status who change their plans and request reinstatement for the semester in which they originally had intended to be away.

Adjustment of Charges,
Withdrawal and Inactive Status

For students who withdraw or declare inactive status during the first 50 percent of the term, or who change from full time to part time, tuition, room, board, and fees will be adjusted according to the schedule that follows. The period for tuition adjustment will be measured from the beginning of classes to the effective date of the change determined by the appropriate academic dean's office.

Withdrawal or declaration of inactive status, or change from full time to part time:

ACADEMIC YEAR 2009/2010

Fall 2009	**Refund**
09/01-09/06/2009	100%
09/07-09/13/2009	90%
09/14-10/04/2009	50%
10/05-10/25/2009	25%

No Refunds After 10/26/2009

Spring 2010	**Refund**
01/13-01/17/2010	100%
01/18-01/24/2010	90%
01/25-02/14/2010	50%
02/15-03/07/2010	25%

No Refunds After 03/08/2010

For students withdrawing or declaring inactive status or changing to part-time status for med-ical reasons, tuition refunds will be calculated after consultation with University Health Serv-ice and the appropriate academic dean's office.

Adjustment of Financial Aid,
Withdrawal and Inactive Status

Financial aid is based upon the total cost of attendance at the University of Rochester. Adjustments to the cost of attendance due to a change of enrollment status (withdrawal or inactive) could potentially result in a reduction of previously awarded financial aid. The Financial Aid Office will determine the reduction in aid after the date of the change in status has been verified by the dean. Federal regulations require that this calculation be completed within 45 days of notification of the change of status.

Inactive students studying at another institution are not eligible for University funding. A Consortium/Contractual Agreement may allow students to receive a Federal Direct Loan, Federal Pell Grant, and, if attending another New York school, TAP funding. Stu-

dents must have already completed their application for financial aid and a Consortium/Contractual Agreement before requesting their federal and state funding to be applied to another school's charges.

Determination of Student Status
The University retains the right to determine the student's status within the University. The University has discretionary powers to maintain a student's enrollment, to grant academic grades, to authorize graduation, or to confer any degrees or grant any certificates. Each student concedes to the University the right to require the student's withdrawal at any time for any valid reason, including failure to pay the term bill.

THE GRADING SYSTEM, TRANSCRIPTS, AND DEGREES

Grades
The undergraduate grading system for all River Campus colleges is as follows:*

Letter Grade	Performance Level	Grade Points
A	Excellent	**4.0**
A–		**3.7**
B+		**3.3**
B	Above Average	**3.0**
B–		**2.7**
C+		**2.3**
C	Minimum Satisfactory Grade	**2.0**
C–		**1.7**
D+		**1.3**
D		**1.0**
D–	Minimum Passing Grade	**0.7**
E	Failure	**0.0**

Grades which carry no grade points:

I	Incomplete
W	Withdraw without effect on the grade-point average
P	Pass (mandatory grading system in certain courses)
S	Satisfactory (Satisfactory-Fail option)
F	Failure (Satisfactory-Fail option)

Additionally, in the College, if the instructor in any course regards the written work of the student as deficient by reason of expository style, the grade will be so flagged on the final grade roster. This flag will not become part of the student's permanent record.

Dean's List
Following the close of the fall and spring semesters, a list is issued of those students whose academic achievement warrants notation on the Dean's List.

An overall semester grade-point average of 3.4 and completion of 16 or more credit hours, at least 12 of which have normal letter grades (A through E), with no "I" or "N" grades, are required for a student to be named to the Dean's List. (Seniors and students classified as Take Five or KEY need to complete successfully 12 or more credit hours with normal letter grades and no "I"or "N" grades.)

Part-time students can be named to the Dean's List by achieving a 3.4 grade-point average in the immediately preceding semester if they have also completed 16 credit hours with a grade-point-average of 3.4 during the preceding 24 months (including summer grades). At least 12 of the 16 hours must be completed with normal letter grades, and the student must have no outstanding "I" or "N" grades.

Probation and Separation
The College regularly reviews the academic progress of registered students and acts to place on probation or separate those not meeting these standards:

- An overall (or cumulative) grade-point standing for all semesters completed of at least 2.0
- A grade-point average for the latest semester of at least 2.0
- Acceptance into a major before achieving junior standing and, once accepted, a grade-point average of at least 2.0 in the courses

submitted for the major.

Usually, the College warns a student of impending difficulty by placing him or her on probation for a semester before considering separation. Students on probation are encouraged to seek advising, tutoring, and counseling assistance. Their advisors are notified of students' academic difficulties, as are the Department of Athletics and Recreation (for students on intercollegiate teams), the Director of Minority Student Affairs (for underrepresented minority students), the International Services Office (for international students), and the Department of Naval Science (for students affiliated with the NROTC Program). Any student whose enrollment is continued will be considered in good academic standing.

The student's dean can be asked to review actions on separation. Any request must be made in writing. Reviews are granted only when pertinent new evidence is presented.

Financial aid for students on probationary status is subject to adjustment. Federal and New York State aid recipients must meet stand-ards of satisfactory academic progress in order to remain eligible for these awards. Additional information about these standards is available from the Financial Aid Office.

Grade Reports
Students may view their grades online through UR ACCESS*plus* at any time. Information available to students includes courses taken, grades received, credit hours earned, and semester and cumulative grade-point averages.

For University policy regarding reports to parents, see University Records, page 192.

Academic Transcripts
Official academic transcripts, which include a record of the student's entire undergraduate program, are issued by the registrar's office to other institutions or prospective employers at the student's written request. The University reserves the right to withhold academic transcripts in the event of an outstanding balance owed the University.

Bachelor's Degree Cum Laude,
Magna Cum Laude, and
Summa Cum Laude
The College recognizes outstanding College-wide achievement of its students by awarding these degrees. The dean assigns the levels of award, based on criteria established by the Steering Committee of the Faculty Council.

Bachelor's Degree with Distinction,
High Distinction, and Highest Distinction
The College recognizes quality of performance in a major by awarding the degree with "distinction," "high distinction," or "highest distinction." Each department establishes its own criteria for the varying levels of distinction subject to the approval of the College Curriculum Committee and the Steering Committee of the Faculty Council.

Bachelor's Degree with Honors
Certain departments in the College offer programs of study leading to the degree "with honors in research." An honors program requires students to complete a minimum of 12 credit hours in courses designated by the department as "honors courses." These courses must include at least one advanced course or seminar and the course or courses in which the senior thesis or research project is completed. Specific course requirements for each major may be found in the appropriate departmental section in this bulletin.

ACADEMIC HONESTY
As members of an academic community, students and faculty assume certain responsibilities. One of those responsibilities is to engage in honest communication. Academic dishonesty is a serious violation of the trust upon which an academic community depends.

A common form of academic dishonesty is plagiarism. This is the use, whether deliberate or unintentional, of an idea, phrase, or other materials from a source without proper acknowledgment of that source; the misrepresentation of sources; the improper use of course materials; the use of papers purchased online; submitting written work, such as laboratory reports, computer programs, or papers, which have been copied from the work of other students. The risk of plagiarism can be avoided in written work by clearly indicating, either in footnotes or in the paper itself, the source of any major or unique idea or wording that the student did not arrive at on his or her own. Sources must be given regardless of whether the material is quoted directly or paraphrased.

Cheating provides a second example of academic dishonesty: using unauthorized notes or other study aids or unauthorized technology during an examination; looking at other students' work during an exam or in an assignment where collaboration is not allowed;

obtaining an examination prior to its administration; altering graded work and submitting it for regarding; submitting work done in one class for credit in another without the instructor's permission; undertaking any activity intended to obtain an unfair advantage over other students.

A student remains responsible for the academic honesty of work submitted in University of Rochester courses, even after the student has received a final course grade. This rule also applies to students who are no longer matriculated at the University of Rochester, including those who have graduated.

Ignorance of these standards will not be considered a valid excuse or defense.

Orientation Honesty Policy

Dissemination

During Orientation in the College, students' pre-major advisors will introduce students to the nature of academic honesty in the College. At that time, they will be handed a written version of the policy and a form acknowledging that they have received information about academic honesty. Signed acknowledgment forms will be collected by pre-major advisors before registration. Transfer students will receive their briefing on academic honesty from the College Center for Academic Support.

These Orientation procedures are designed to reinforce the importance of academic honesty.

All students (matriculated and non-matriculated) enrolled in the College or in College courses must adhere to the College's academic honesty policy, even if they do not attend Orientation or sign the acknowledgment form.

TRANSFERRING WITHIN THE UNIVERSITY

The College

First-year students are admitted directly into the College either to pursue a major in arts and sciences or in engineering and applied sciences and may freely change majors within these areas, provided they have completed, or can schedule, the appropriate prerequisites.

Students considering changing majors should seek assistance from faculty members and dean's office personnel to help ensure that their first-year courses both explore potential majors and prepare the student for each one which might be chosen.

Student Services

OFFICE OF THE COLLEGE DEAN OF STUDENTS
Matthew Burns *Dean of Students*
Anne-Marie Algier *Associate Dean of Students*
Morgan Levy *Assistant Dean of Students*
Dawn Bruner *Director, Parent Relations*
Glen Cerosaletti *Director, Rochester Center for Community Leadership*
Monica Smalls *Director, Fraternity and Sorority Affairs*

The Dean of Students Office provides programs and services that enhance student learning, promote community development, and support the educational goals of the undergraduate and graduate populations in the College. Through collaborative initiatives, the Dean of Students Office is dedicated to promoting a strong quality of life for students in both the academic and nonacademic realms. Areas of responsibility are described below.

Student Conduct: Oversight of the disciplinary system regulations, policies, and procedures rests in the Dean of Students Office. Additional activities include raising awareness of conduct expectations, assisting with alcohol and drug education, mediating differences, and fostering student learning through the judicial process.

Mediation Services: Mediation is a voluntary process during which students involved in a dispute work with a specifically trained neutral party to generate their own solutions to settle their conflict. The goal of the mediation process is that students communicate and agree on an outcome rather than an administrator or other third party imposing one. Any currently enrolled students in the College may take advantage of this service.

Emergency Loan Program: The Office of the Dean of Students administers an Emergency Loan Program, which provides assistance to students for unexpected expenses. Undergraduate students may borrow up to $150, and graduate students may borrow up to $300.

For more information about the Dean of Students Office, visit www.rochester.edu/college/dos.

Wilson Commons Student Activities
Wilson Commons Student Activities enhances the college experience and creates a diverse campus community by supporting over 200 student organizations. The office focuses on helping student leaders achieve their goals by encouraging them to explore and develop their interests and passions through experiential learning outside the classroom. The office provides information about all student organizations, provides resources to student organizations and the University of Rochester community, and assists students in forming new organizations. In addition, the office manages the University's student union, Wilson Commons, and coordinates major traditional events of the College such as Yellowjacket Weekend, Boar's Head Dinner, Winterfest, and Senior Week.

Student Government: The Students' Association includes all undergraduates and is governed by a student-elected Senate, president, and vice president. The Senate and its over 75 funded organizations are supported by the student activities fee, which is assessed to all full-time undergraduate students. Six standing committees: the Policy & Review Committee, the Projects & Services Committee, Students' Association, Appropriations Committee, Club Sports Council, and Steering Committee.

Clubs and Organizations: Students can be involved in and attend events sponsored by a wide range of student organizations under the following categories: Academic Undergraduate Councils, Club Sports, Community Service, Class Councils, Awareness, Entertainment Programming, Intercollegiate Competition, Performing and Fine Arts, Publications and Media, and Religious. Information regarding all student organizations, their officers, and their activities is stored on Campus Club Connection (www.rochester.edu/living/organizations). At the beginning of each semester, students can attend an Activities Fair that showcases the wide variety of student organizations on campus.

Parent Relations
Parent Relations, in collaboration with offices across the University, helps parents understand and support the student experience, learning, and growth. This office assists in orienting families to the University of Rochester and serves as a resource for parents throughout their student's undergraduate career. It is our goal that members of the University of Rochester parent community feel *informed, valued, and respected.*

Parent Relations publishes the *UR Family Newsletter* each semester. This newsletter updates parents and families on campus news and provides information about important on-campus student services. The *UR Family Newsletter* is mailed to students' home addresses twice a year. In addition, Parent Relations works collaboratively with University Communications and the Parents Program to produce *Parents Buzz*, an e-newsletter for parents. Please visit our Web site at www.rochester.edu/parents/ or call us at (585) 275-5415 for more information.

Fraternity and Sorority Affairs (OFSA)
The University of Rochester understands the role fraternities and sororities play in campus life with 23 percent of the student body being members of the fraternity and sorority community. The College has developed a strong, viable college-centered program representing our efforts to create a framework based upon the College culture that encourages the cultural values, expectations, and practices of fraternities and sororities that are consistent with the values and academic mission of the College.

Utilizing the Communal Principles and the educational philosophy of the College, the University of Rochester developed the *Expectations for Excellence.* This vibrant, success-driven model for the fraternity and sorority community focuses on attaining true college-centered chapters and guides the work coordinated by OFSA with the 31 recognized chapters within the three governing councils, the Fraternity Presidents' Council, the Multicultural Greek Council, and the Panhellenic Association.

For more information about the Office of Fraternity and Sorority Affairs visit www.rochester.edu/college/ofsa.

Rochester Center for Community Leadership (RCCL)
Rochester students have historically been active citizens and leaders in both official and unofficial capacities. The Rochester Center for Community Leadership strives to educate students to become engaged citizens and leaders, capable of effecting positive social change in their communities.

Leadership Programs: Throughout the academic year the center offers unique leadership development opportunities for undergraduate students. The Skills for UR Leaders workshop series and Paychex Leadership Institute provide students with practical organizational skills and competencies. The center also sponsors a course, Leader to Leader, which examines the history, theory, and practice of leadership with guest appearances by local and national leaders in business, education, government, and politics. Each spring students are recognized for their contributions to the campus and Rochester communities through the Women's Leadership Awards and Student Life Awards.

Community Service Opportunities: The center oversees various programs that enable students to connect with the community in ways that have a measurable impact for students as well as community partners.

Wilson Day: An annual orientation activity that engages new students in the life of the Rochester community through a day of service during the first week of college.

Urban Fellows Program: A paid summer internship program for area college students. The program immerses fellows in the life of the City of Rochester through on- and off-campus programs that engage them in current urban and community issues. Fellows work four days a week in community agencies and attend seminars on urban issues one day a week.

National Campaign for Political and Civic Engagement: Through the Center for Community Leadership, the University is an active participant in this consortium, which seeks to inspire undergraduate students to enter careers in politics and public service by involving them in community service, voter registration, and public service internships.

Rochester Every Day: This discount program encourages students to get off campus and explore the city that is their home. By patronizing local businesses, students play a key role in fostering a vibrant business climate in the community.

Complete information about all of the center's programs can be found online at www.rochester.edu/college/rccl.

School of Nursing students should refer to the *School of Nursing Student Handbook*.

RESIDENTIAL LIFE
The Residential Life Program is designed to enhance students' academic progress and opportunities for personal growth. As a comprehensive program, Residential Life provides undergraduate housing and programs; Special Interest Housing; ResTV; graduate/family housing; as well as off-campus housing listings and support services. If it has to do with where any student lives, it's within the Residential Life mission. Visit Residential Life at www.reslife.rochester.edu for more information.

School of Nursing students should refer to the *School of Nursing Student Handbook*.

DINING SERVICES

University Dining Services satisfies nutritional needs of students by serving outstanding, value-added meals. Unique, chef-inspired menus, featuring international dishes, seasonal influences, and fresh ingredients add flavor to the dining choices.

ATHLETICS AND RECREATION

The Department of Athletics and Recreation strives to provide vibrant, student-oriented programs that enhance the educational experience and recreational interests of the members of the University community. The department supports the educational mission of the College by providing high-quality instruction and facilities to attract the best students and provide them a meaningful athletic and recreational experience as a part of their overall development.

Twenty-two Intercollegiate varsity programs offer a competitive Division III opportunity for 500 student-athletes. The intramural sports program features traditional competition and group fitness classes for over 3,500 participants. The diverse 35 club sports program accommodates approximately 1,000 students. More than 1,500 students, faculty/staff, and community members use the Goergen Athletic Center on a daily basis.

For additional information, call (585) 275-7643.

CAREER CENTER

This nationally recognized facility is dedicated to providing state-of-the-art career planning, job search coaching, placement services, and academically linked career counseling that will lead students in the College successfully through and beyond their undergraduate years. Services and resources include:

The Hyman J. V. Goldberg Career Library —a comprehensive resource center for general career planning and researching specific internship and post baccalaureate opportunities. Holdings include one of the nation's best online and printed collections of career and job-search publications, employer information, graduate school materials, and testing information. Through job-search work stations, students access Web resources and use phone and fax capabilities to communicate with prospective employers and graduate schools and to network with alumni.

Pregraduation Student Employment Services—opportunities for students, regardless of demonstrated financial need, to work during their college years either in on-campus positions or for off-campus Rochester-area employers. From traditional jobs earning money for "living expenses," to truly preprofessional employment, Student Employment offerings emphasize the financial and experiential benefits of working within varied settings prior to graduation. All on-campus positions are posted and regularly updated on the Student Employment Web site accessed via www.rochester.edu/careercenter/seo.

Internet Resources—increasingly, the Center uses Web-driven resources and instructs students how to maximize their use. Basic information about services and programs, as well as links to additional University and other sites, can be accessed via www.rochester.edu/careercenter. The Center uses a state-of-the-art online database which allows students to register for on-campus recruiting, submit résumés for referral to internship and post graduation employers, view postings, and link to employer Web sites. Rochester is one of a select number of institutions nationally that uses this tool. Also, the Center's career counseling services enable students to complete two of the most popular vocational assessment devices, the Strong Interest Inventory and Myers Briggs Type Indicator, online prior to individualized interpretation sessions.

Off-Campus Recruiting—annually, the Center hosts Career and Internship Connection events in New York City, Boston, Chicago, San Francisco, and Washington, D.C. These events blend the best of career fair and pre-screened recruiting offerings, with Rochester students interacting with some of the most selective employers in each city. Each year hundreds of interviews for post baccalaureate positions and internships are generated through the CIC events. Rochester students annually are selected for the most interviews by employers.

Externships and Reach Funding—focusing on the needs of first- and second-year students, the Externship program offers freshmen and sophomores the opportunity to shadow alumni and others within specific fields of interest. For many, this will be the first of many "alumni networking and career exploration" experiences. Reach Funds are available to make unpaid or underpaid internships financially feasible. Students gain commitments from employers, then apply for stipends that will make summer and academic year internships viable options.

Postgraduate Professional and Graduate School Advising—for students planning to apply to graduate programs of study. Advising and application process assistance is available through individual appointments as well as annual programs and workshops. The Center also refers candidates to a Web-based recommendation file service.

The Center's philosophy is to emphasize the importance of gaining experience and clarifying goals while still an undergraduate. These experiences include on-campus employment and research activities as well as internships. The Reach for Rochester program

has, since 1986, facilitated more than 1,200 internship placements nationwide, netting close to $5 million in earnings for participating students and annual stipends in excess of $90,000.

The purpose of all programs of the Career Center is to help students articulate their abilities in the language of prospective employers as well as post baccalaureate graduate programs. The Center recognizes that many first post-commencement positions are not directly related to the titles of particular majors, while it emphasizes a powerful confidence that Rochester students can and do succeed within a variety of pursuits. Employers regularly indicate that the most important traits a candidate can possess, especially among liberal arts graduates, may be the abilities to conduct research, analyze data, and present findings in verbal and written formats independently or as a member of a group. Employers express a desire to identify candidates who can create verbal and behavioral bridges from what they have done to what they can do. Creativity, curiosity, analytical skills, and the ability to articulate are exactly the qualities that University of Rochester students possess and project.

While many Rochester alumni enter the employment market immediately upon graduation, almost three-quarters of recent graduates report that they have enrolled in a graduate program within five years of receiving their bachelor's degrees. Assistance in applying to professional and graduate school programs is available through the Career Center and is complemented by the specific advising services previously described.

Students in the School of Nursing should contact the Office of Student Affairs at (585) 275-2375 for career resources.

MINORITY STUDENT AFFAIRS

The Office of Minority Student Affairs focuses on enhancing the academic life of minority students. The office actively collaborates with University departments to promote student academic success and retention, and to ensure they successfully negotiate university life.

The office's emphasis on academic success is facilitated by providing such services as student counseling and referrals, promoting educational opportunities, offering workshops and symposia, and broadening the awareness of issues of relevance to minority students in the University community.

The Office of Minority Student Affairs manages two programs for the College:

Early Connection Opportunity (ECO) Program—ECO is a prefreshman summer residential orientation program designed to offer supplemental academic support in order to assist students in making a successful transition from high school to college. Participating students will learn about the attitudes, skills, and social connections that characterize successful University of Rochester students. ECO will prepare students for classes, inform them about resources and services available to them, and introduce them to social life on campus.

Higher Education Opportunity Program (HEOP)—HEOP serves students of diverse racial, ethnic, and cultural backgrounds. It is a program that provides an opportunity for eligible applicants to attend a private four-year institution of high academic standing. The program is designed to assist those students who, because of their economic and educational background, might not consider attending our University. HEOP staff coordinate a variety of academic support, counseling, and financial aid services to enable participating students to successfully complete a degree in 8 to 10 semesters. To be eligible for HEOP, students must be residents of New York State and meet specific academic and economic criteria.

The Office of Minority Student Affairs is located in 310 Morey Hall. For more information, feel free to contact us at (585) 275-0651 or via e-mail at omsa@mail.rochester.edu. Also, please visit our Web site at www.rochester.edu/college/OMSA.

INTERFAITH CHAPEL

Distinguished by the diversity of its members, the College welcomes men and women from various faiths practiced by the world's peoples. The Interfaith Chapel affirms and celebrates a rich mixture of religious expression and heritages by offering a variety of opportunities for religious worship and meditation, social service and personal counseling, and cultural and social events. Chaplains and advisors are available to work with all members of the University community. The director of the Interfaith Chapel works with students, chaplains, and University departments to facilitate and coordinate the many programs carried on within the chapel. Chapel rooms may be reserved for lectures, discussions, or social events.

While there are regular Catholic, Jewish, Muslim, and Protestant services run by chaplains, the Chaplain's Office also helps identify advisors from other religious traditions to actively support and work with other groups. Students can call 275-4321, TTY 461-1773 to learn more about those options.

INTERNATIONAL SERVICES OFFICE

The International Services Office (ISO) provides a full range of programs and services for approximately 1,500 international students and 500 scholars from over 90 countries who study and work at the University each year. The ISO administers under specific government regulations the F-1 and J-1 visa programs. The ISO staff issues immigration documents through the Student Exchange

Visitor Information System (SEVIS) and provides advising on immigration regulations that affect internationals at the University.

The ISO acts as the University's official liaison with the Department of State, foreign and American consulates, the Department of Homeland Security, and local government agencies. The ISO also works with members of the University community to advocate for and address various needs of international students and scholars.

The ISO also serves as an information resource to assist internationals in adjusting to the United States, the University, and the Rochester community. Other services and programs include a comprehensive Web site (www.iso.rochester.edu); an electronic newsletter; tax, travel, and employment workshops; and individual counseling to assist students in effectively coping with personal and cultural adjustment. In order to promote intercultural understanding, cultural, social, and educational programs are planned each year and cosponsored with campus and community groups, including the Rochester International Council. The ISO also offers a comprehensive international student orientation program each fall to welcome new arrivals and help orient them to the University.

LEARNING ASSISTANCE SERVICES (LAS)

Academic effectiveness is a major concern of many students. The following services are offered by LAS to help students in the College improve academic performance.

Peer-Led Science and Math Support. Students can participate in weekly math and science workshops and study groups to improve - problem-solving skills and become more confident when taking exams. These problem-solving group sessions are available for a wide range of courses.

Study Skills. Individual counseling and group workshops address concerns about preparing for exams, reading effectively, taking notes, managing time, enhancing concentration, and developing academic motivation. In concert with the Office of Minority Student Affairs, LAS also provides a study skills course in both the fall and spring semesters; this course is available to all students.

Disabilities. Students with disabilities can receive help in planning academic accommodations and developing strategies for meeting the demands of coursework.

Students seeking more information or wishing to make appointments may do so in person or by phone. The main office of Learning Assistance Services is located in 107 Lattimore Hall, (585) 275-9049. Our Web site can be found at www.rochester.edu/College/las.

Nursing students seeking learning assistance, should contact the school's Student Affairs Office.

STUDENTS WITH DISABILITIES

The coordinator of the Office of Disability Resources works closely with resource coordinators in each school to review documentation of the existence of a disability and to make recommendations for reasonable classroom accommodations. The coordinator also works with the Office of Residential Life, Student Activities, and campus libraries to make arrangements for support services and needed resources. *Classroom Accommodations, a Guide for Students with Disabilities*, which describes the University's disability accommodation policy and procedures, is distributed to all students who have accepted admission to the University and can be found at www.rochester.edu/ada/saccom.html. Anyone seeking further information about what resources are available should contact the Office of Disability Resources at (585) 275-9125.

TESTING

The Testing Office administers proctored final examinations, national testing programs as noted below, as well as a variety of special exams.

Additional information about testing programs can be obtained in the Testing Office in 312 Lattimore Hall. The major testing programs administered by this office include:
Graduate Record Examination (GRE)— subject only
Law School Admission Test (LSAT)
Miller Analogies Test (MAT)
Pharmacy College Admission Test (PCAT)

Questions about other national testing programs should be directed to the Testing Office. If the tests in question are not given there, students will be referred to the proper locations.

WRITING CENTER SERVICES

The Writing Center is staffed by trained graduate-student consultants and undergraduate fellows who offer critical feedback on writing during any stage of the writing process. Writing consultants and fellows come from disciplines across the sciences, social sciences, and humanities.

- Writing consultants are available by appointment.
- Writing fellows are available for walk-in hours Monday–Thursday evenings and on Sundays in Susan B. Anthony Halls,

Room 166, and in the Writing Center in Rush Rhees Library, Room G-121.

The Writing Center also provides a comfortable and quiet computer writing room for working on writing projects and celebrates the work of outstanding undergraduate writers during our annual spring Writing Colloquium.

Write-On: Our Community of Online Writers

The Writing Center responds online and within 24 hours to queries from University of Rochester students, faculty, and staff.

For more information about writing support services, please contact the College Writing Program, Rush Rhees Library, Room G-121, (585) 273-3584 or visit the Web site at http://writing.rochester.edu.

Students in the School of Nursing should contact the Office of Student Affairs at (585) 275-2375 regarding writing assistance services.

HEALTH SERVICES

Primary health care is provided for all full-time University students on a prepaid basis through the Student Health Program. Medical care and health education services are provided by the University Health Service (UHS), and mental health services are provided by the University Counseling Center (UCC). Access to medical and mental health care is provided 24 hours a day, 7 days a week, throughout the calendar year. The University Health Service/Counseling Center is accredited by The Joint Commission.

Health Plan. All full-time students pay a mandatory health fee that entitles them to use the Health Services throughout the academic year and the following summer (September 1 to August 31), as long as they are enrolled on a full-time basis. The mandatory health fee covers visits to UHS primary care providers in the University Health Service (UHS), limited visits to UCC mental health professionals, and health education services. In addition to the mandatory health fee, all full-time students must have health insurance. Health insurance is available through the University Health Service. This plan covers diagnostic laboratory tests and X-rays, surgical procedures, hospitalization, and other specific services not covered by the mandatory health fee. Students already covered by health insurance comparable to the University-sponsored plan can waive the fee for health insurance. All non-immigrant international students and their families who are in the United States with them must comply with INS requirements and University policies governing health insurance.

A family insurance plan is available for students who wish to have coverage for themselves and their dependent child(ren).

Each year, all full-time students must inform UHS about their health insurance coverage by completing the online Health Insurance Selection Process. Students who do not complete this process will automatically be enrolled in the health insurance offered through the University Health Service. Students are financially responsible for fees not covered by their health insurance. Should a student choose to see a private physician or seek care outside UHS without the appropriate referrals, the student assumes responsibility (including financial responsibility) for the health care received.

UNIVERSITY HEALTH SERVICE (UHS)

The University Health Service (UHS) provides a full range of confidential, high-quality primary health care services for full-time University of Rochester students. The UHS clinical staff includes physicians who are specialists in internal medicine, nurse practitioners, and registered nurses. To provide students with more personal and effective interaction, all students are assigned a primary care provider (PCP) at UHS. Students are encouraged to schedule appointments with their PCP.

UHS provides a full range of primary care services, including the treatment of illnesses and injuries, women's health care, the management of ongoing medical problems, and care and advice for any health concerns. Health education programs and services are provided by the UHS Health Promotion Office.

Confidentiality. The relationship between health care providers and their patients is confidential. UHS will not share information about the fact or nature of a student's visit to UHS without the student's permission. Notification of others, including parents, is considered the student's responsibility unless the condition is serious and the student is unable to assume responsibility for informing others. Parental notification and consent will be obtained for students under age 18, as required by law.

Locations and Hours. For the convenience of students, UHS has offices on the River Campus, in the Medical Center, and at the Eastman School of Music. The River Campus Office is located in the University Health Service Building, which is next to Susan B. Anthony Halls. This office is open seven days a week during the academic year and on weekdays during school breaks and in the summer. The office in the Medical Center is open weekdays throughout the year. The Eastman School of Music office, located in the Eastman Student Living Center, is open weekdays during the academic year, while classes are in session. The hours are listed on the UHS Web site.

Scheduling an Appointment. Visits to UHS are by appointment at the UHS offices on the River Campus and in the Medical Center. Students should call the main appointment line at 275-2662 to schedule an appointment.

Students at the Eastman School of Music can walk in without an appointment to see the registered nurse. Visits with a physician or nurse practitioner at the Eastman office are by appointment.

When UHS Is Closed: UHS provides access to medical care 24 hours a day throughout the year. Whenever UHS offices are closed, a UHS physician is on call and available by phone for urgent concerns that cannot wait until UHS reopens. Unless it is a life-threatening emergency or a serious accident, students should call UHS (275-2662) before going elsewhere (i.e., the emergency department of a local hospital) for care. In an emergency, students should call Security at x13 for immediate assistance.

Health History Forms/Immunization Requirements. All entering matriculated full-time and part-time students must submit the Health History Form, which includes immunization information, prior to the start of classes. New York State law requires all students to provide proof of immunity to measles, mumps, and rubella. Students who fail to comply with the requirements will be withdrawn from the University. Students with questions can contact UHS at hhf@uhs.rochester.edu or (585) 275-0697.

Health Education. The UHS Health Promotion Office promotes the wellness of the University community by providing educational programs and activities that encourage the development of a healthy lifestyle and the effective use of health care services. The office provides opportunities for students to become involved in promoting health on campus. Students interested in getting involved and/or wanting to schedule a program are asked to call 273-5775.

UHS Web Site. Located at www.rochester.edu/uhs, the UHS Web site offers complete information about UHS services, hours, locations, health insurance, announcements, and more. Information on a wide variety of health topics and links to reputable sites are also available on the UHS Web site.

UNIVERSITY COUNSELING CENTER

The University Counseling Center (UCC) offers time-limited individual and couples therapy and yearlong group therapy to all students through the mandatory student health fee. UCC therapists have experience in assisting students with a variety of concerns such as anxiety, apprehension about major life decisions, depression, relationship difficulties, family problems, eating concerns, sexual functioning, sexual identity, roommate hassles, and general discomfort about what is happening in a student's life. UCC also offers a variety of therapy groups on topics such as adult children of alcoholics, survivors of sexual abuse, eating disorders, bereavement, and relationship issues.

Confidentiality: All contacts with a UCC therapist are confidential. The fact that a student is using UCC will not be disclosed to any University official or faculty member, or to family, friends, or roommates without permission of the student. Because of the sensitive nature of visits, extreme care is taken to protect the confidentiality of patients' records. UCC records are separate from UHS medical charts and from Strong Memorial Hospital records.

Locations and Hours: UCC is located on the third floor in the University Health Service Building on the River Campus. UCC also has an office in the Eastman Student Living Center at the Eastman School of Music. The office on the River Campus is open weekdays all year. The Eastman School office is open part time during the academic year, while classes are in session. The hours are listed on the UCC Web site. Appointments for any UCC office can be scheduled by calling 275-3113.

After-Hours Care: A mental health professional is on call and available 24 hours a day throughout the year to deal with urgent situations and can be reached at 275-3113 any time of the day or night.

UCC Web Site. Located at www.rochester.edu/ucc, the UCC Web site provides information about the services provided and links the reader to other online health care sites. In addition, mental health questions can be addressed to the UCC online resource "Dear Dr. Ana-Lyze." This site is to be used strictly as an educational tool and in no way attempts to replace formal therapy.

AUXILIARY SERVICES

University policy requires that parking, food, bookstore, and housing services—services that are used selectively and substantially as matters of individual preference—be sustained by the fees and other charges paid by those who use them, including provisions for depreciation, replacement of equipment, and maintenance. Those services, therefore, are self-supporting and not supported by the University's tuition and other educational income.

AUTOMOBILES AND PARKING

Students may bring automobiles to the University, but should be aware that parking spaces for students in residence on the River Campus are limited. Monday through Friday from 7:30 a.m. to 7 p.m. on-campus parking for students, employees, and visitors is by permit. Commuter students are guaranteed access to parking permits. Resident students may find that the only parking space available to them is in a lot some distance from the campus.

Parking for resident students is offered by lottery to those who preregister (no freshman parking). Priority is by class year. It is possible that all space may be in use before all resident students have purchased parking permits. Most resident students make use of the shuttle buses between University properties. Free shuttle buses providing service from the more distant lots to the campus run various times weekdays when school is in session.

Vehicles displaying any paid parking permit may park in central campus lots not restricted by posted signs between 4 p.m. and 7:30 a.m. weekdays, and at any time on weekends and University holidays.

For one-day visits to the campus, parking information is available (and permits for the day may be purchased) at the Visitor Information and Parking (VIP) Booth on Wilson Boulevard near Elmwood Avenue.

Wilson Boulevard is a city park road at the edge of the River Campus. Parking on Wilson Boulevard is limited to short-term meters and is not intended for student use.

BICYCLES, MOPEDS, MOTORCYCLES, AND SCOOTERS

In all but the snowiest of seasons, bikes are a convenient and popular means of getting between University buildings and to nearby shopping areas. Parking permits are required for motorcycles. The annual fee for motorcycles in 2009–2010 is $20.00. Parking permits are not required for bicycles. Their use is subject to University regulations. Generally speaking, these vehicles are not permitted in University buildings and may not be locked to trees, lamp standards, railings, or the like.

More information on parking guidelines and shuttle bus schedules may be found on the University's Web page at www.rochester.edu/parking/.

INTERCAMPUS AND PUBLIC BUS SERVICES

First Transit provides free scheduled shuttle bus service to members of the University community with a University I.D. between River Campus, Medical Center, South Campus, all University apartment buildings, and off-campus parking lots. Free service is provided also between River Campus, Memorial Art Gallery, the Eastman School of Music Living Center, and stops at selected points along the route.

Regional Transit Service (RTS) will continue to provide regular, full-fare, scheduled service between downtown Rochester and University facilities.

BANKING SERVICES

Branches of JPMorgan Chase Bank are
located on the River Campus in Todd Union and at the Medical Center. Each provides full service banking. Check cashing is provided for students who have JPMorgan Chase accounts. Such service also may be provided, up to a $100 maximum, at nominal charge for others with a University identification card. Additionally, ATMs are located throughout the campuses.

ATMs are located throughout River Campus. The ATMs are as follows: JPMorgan Chase Bank in Todd Union and Rush Rhees Library Road, HSBC Bank in Wilson Commons, and Advantage Federal Credit Union in Susan B. Anthony Halls.

ATMs are also located throughout the Medical Center. The ATMs are as follows: JPMorgan Chase Bank at 260 Crittenden Blvd. entrance and SMH lobby, and Advantage Federal Credit Union at north corridor entrance to Kornberg Atrium and Crittenden Blvd. loop entrance.

CAMPUS POST OFFICE

The Campus Post Office is a privately run
station of the United States Postal Service that is staffed by University personnel. The USPS contracts the University to sell postage and money orders, and handle special service mail such as Express, Certified, Registered, and Insured. Another postal service office is located in the University Medical Center.

In order to receive mail and packages on campus, students must have their own post office box. Private carrier companies (UPS, Fed Ex, RPS, Airborne, etc.) can be shipped directly to the students' CPU box; packages of any size cannot be sent to individual residence hall rooms. Incoming freshmen will automatically be assigned a CPU box number at orientation. Mail is delivered to students Monday through Friday, except on University holidays.

When students receive a package or piece of special service mail, they are notified by e-mail. The USPS does not deliver mail to the University on Saturdays or Federal holidays, except for Express Overnight deliveries. By taking advantage of the intramural mail system, students can send mail to any University location, postage free.

For a nominal fee, students can send or receive faxes at the Campus Post Office, as well as sending packages via UPS or Federal Express. A variety of packaging supplies are also available for purchase.

The box fee for an undergraduate student is $40 for the period July 1 through June 30.

STUDENT IDENTIFICATION CARDS

The University provides identification cards for all students. They are required for checking out books from the library, cashing checks on campus, and may be required for admission to various campus events, certain facilities, and activities. The card displays the student's name, an identifying color bar for campus affiliation, and picture. Students at the Medical Center are required to wear identification badges. The student identification card serves this purpose; worn as a lapel badge or displayed from a lanyard. ID cards include a magnetic stripe and a bar code, which serve as keys for authorized admission to residence halls, laboratories, and other areas secured by access card readers. The ID card is required by students to make purchases from their Dining Plan contracts, vending machines, and campus convenience stores. In addition, the student ID card is the principal means for identification on campus and it is useful for positive identification elsewhere.

Entering first-year students are photographed during Freshman Orientation and keep their cards through their senior years. Transfer students are photographed early in the fall and spring terms. The respective colleges arrange special ID card photo sessions for entering graduate student orientation programs. No charge is made for the initial identification card, but there is a fee for replacement of a lost card. Worn or damaged ID cards may be turned in for a free replacement. Upon turning 21, a student may go to an ID Card Officer and exchange an "Under 21" ID card, to include an updated photo and a change in the age designation field to "21 or Over." There is no charge for this service.

UNIVERSITY INTERCESSORS OFFICE

Intercessors provide a resource for solving problems that have not been addressed elsewhere in the University. Students, staff, or faculty members who have concerns about their University experience that cannot be worked out through obvious channels are encouraged to contact the intercessors office for assistance. This office is particularly interested in identifying patterns of problems that indicate a need to change organizational structures or procedures. Helping individuals is an important way to learn what needs to be done to improve the total environment. Intercessors are able to address concerns regarding sexual harassment, racial harassment, and discrimination on the basis of gender, disability, and age. The intercessors office can be reached by phone at 275-9125, 275-5931, and 275-4354 (Medical Center).

SECURITY SERVICES

Campus Crime Statistics

By October 1 of each year, University Security Services provides to all students and staff an annual report with current campus security policies, procedures, programs, and statistics. In addition, free copies are provided to prospective students and staff on request. Crime statistics are reported to the United States Department of Education (US DoEd). The statistics are available on their Web site at http://ope.ed.gov/security/ and on the University's site at www.security.rochester.edu/. You can also obtain a hard copy of the report, titled *Think Safe*, by contacting University Security Services at (585) 275-3340. University Security services are available 24 hours/day, 7 days/week by calling x5-3333 from any campus phone or by dialing x13 for emergencies. In addition, Cingular (AT&T) and Verizon customers may make a free call to our emergency Communications Center by pressing #413 from their cell phone. We are in immediate contact with local police, fire departments, and emergency medical resources.

UNIVERSITY INFORMATION TECHNOLOGY

Computers, networks, telephones, and
information technology are a vital part of
the University experience. University Information Technology provides these IT services to enhance your education.

Students at the University of Rochester have access to

- a high-speed data network accessible from residence halls and across campus.
- University-authenticated wireless at many academic and public locations around campus. The University IT Web site contains an up-to-date coverage map.
- an on-campus IT Center which has a staffed help desk for walk-in technology questions as well as the largest public computing lab on the River Campus.
- computing facilities equipped with modern technology to help with assignments.
- two onsite computer stores that offer educational discounts on computers, hardware, software, computer accessories, popular consumer electronics, and other related information technologies.
- broadcast-quality music through convenient online media services.
- competitive long-distance rates and discounted cellular service.

Students living in residence halls are also provided with on-campus digital telephone service, free local calling, voice messaging service, and 24-hour on-campus directory service. For other information about enhanced voicemail, analog adaptors, ADA-

compliant services, or TTD equipment, please contact the IT Center at www.rochester.edu/it, UnivITHelp@ur.rochester.edu, or (585) 275-2000.

Admissions

UNDERGRADUATE ADMISSION

The University of Rochester welcomes self-directed students who demand the freedom to study what they love. These students appreciate the opportunities available through a major research university, yet want the personalization of a smaller school. Undergraduates are admitted as freshmen or as transfer students for full-time or part-time study. Application forms, appointments for campus visits, and other information may be obtained by writing to the Office of Admissions, University of Rochester, P.O. Box 270251, Rochester, NY 14627-0251, by calling (585) 275-3221 or (888) 822-2256, or via the Web at www.rochester.edu.

Individual attention is given to each student from the time he or she first becomes interested in the University. A staff of counselors and many faculty members participate in the advising of applicants and review of applications. Admission decisions are based on a student's high school work, recommendations from instructors and counselors, participation and leadership in school and community life, verbal and analytical skills, outstanding achievements and talents, unique contributions to the residential college environment, and for transfer students, college coursework already completed. Admissions interviews are recommended for prospective students. Applicants to the University should schedule an interview with an admissions counselor or alumni volunteer by visiting www.enrollment.rochester.edu/admissions/events.

For admission procedures for the School of Nursing, please call (585) 275-2375 or visit www.son.rochester.edu.

RECOMMENDED PREPARATION FOR ADMISSION

The University does not expect a specific minimum for high school or college grades or test scores. Students who can grow and learn through Rochester's academic programs and opportunities do not fit one particular mold, and grades and test scores are not the only indicators of potential success. Therefore, students are evaluated in terms of their individual accomplishments. Rochester requires a secondary school report with recommendation(s) and a transcript showing commitment and achievement. Most applicants complete at least 32 semester units in academic coursework, chiefly English, mathematics, social sciences, laboratory sciences, and foreign languages. Honors, Advanced Placement, or International Baccalaureate courses are expected of students in secondary schools offering these programs.

Current licensure as a registered nurse or a prior baccalaureate degree in a non-nursing field is an admission requirement for all School of Nursing programs.

VISITS TO THE UNIVERSITY

The College's Office of Admissions welcomes families for information sessions, interviews, and campus tours on most weekdays throughout the year, including many holidays. Some weekend options are offered during the spring, summer, and fall.

Prospective students and their families who visit the campus find that informal conversations with counselors, current students, and faculty prove invaluable. Sometimes the Office of Admissions can arrange overnight accommodations on campus for prospective students. Requests to visit campus or to stay overnight should be made at least two weeks in advance.

Students with questions concerning academic departments, student life, or extracurricular activities may contact Admissions or inquire via e-mail at admit@admissions.rochester.edu.

Applicants who cannot travel to Rochester may wish to speak with an alumni representative in their area. To schedule an interview, visit www.enrollment.rochester.edu/admissions/events. Another way to get a feel for Rochester student life and academics is the video "Meliora," available online at www. viddyou.com/univ_rochester.

For information on visiting the School of Nursing, please contact the school's Student Affairs Office.

TRAVEL INFORMATION

Rochester is served by many major airlines. The campus can be reached by taxicab from Rochester International Airport (ROC) in approximately 10 minutes. The Greyhound and Trailways bus terminal is within walking distance of East Main Street, where Regional Transit Service Bus No. 19 or a taxi may be taken to the River Campus. Transportation to Rochester is also provided by Amtrak trains. The River Campus is located on Wilson Boulevard at Elmwood Avenue.

APPLYING TO ROCHESTER

Students may apply to enter Rochester for either the fall or spring semester. Applications should be submitted by October 1 for spring consideration and January 1 for fall. Prospective freshmen wanting an early decision for the following fall should see the instructions below.

The following materials are required before the application review can begin: an official copy of a high school transcript, recommendations from a counselor and a teacher, an official SAT or ACT score report, and completed application forms, including a personal essay.

Rochester accepts the Common Application (www.commonapp.org) and the Universal College Application (www.universalcollegeapp.com). Students may obtain copies of both applications from their secondary schools or online at the Web sites listed above.

Applicants are invited to submit additional instructor recommendations and other materials which may be useful in the application review.

Prospective nursing students should request nursing application forms from the Office of Student Affairs, School of Nursing, Box SON, 601 Elmwood Avenue, Rochester, NY 14642. Admission requirements and application forms for the School of Nursing differ from those of the College.

College Entrance Examinations

Applicants for admission are required to take either the Scholastic Assessment Test (SAT Reasoning) of the College Entrance Examination Board (CEEB) or the American College Test (ACT) of the American College Testing Program. Both are offered several times a year at centers throughout the world. Scores from SAT Subject Tests and junior-year Advanced Placement (AP) and International Baccalaureate (IB) exams are -recommended but not required.

Applicants for fall admission should take the SAT or the ACT by January of the final year in secondary school. Applicants whose native language is not English are required to submit scores from the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). If applying for Early Decision; academic merit scholarships; guaranteed graduate admissions programs in medicine, business, engineering, or education; or spring admission, applicants should take the SAT or the ACT by October. The University of Rochester code is 2928 for the SAT and TOEFL, and 2980 for the ACT.

Early Decision

Students who decide that Rochester is their first-choice college may apply for an Early Decision on their applications. If admitted, Early Decision candidates agree to withdraw all other applications and enroll at Rochester.

If the application is completed by November 1, candidates are notified of the admission decision by December 15. Please note that Early Decision candidates should take the SAT I or ACT by October.

If Rochester is a student's first-choice college, it is to the student's advantage to apply for Early Decision. Those applicants not admitted Early Decision may be reviewed again as a regular decision applicant.

Notification of Admission Decision

An applicant for spring term admission will usually be notified soon after the application is complete. Applicants for the fall semester will be notified by April 1. For fall regular decision admission, Rochester subscribes to the uniform Candidates' Reply Date, whereby admitted students are not required to notify the University of their decision until May 1.

By that date, students who accept the offer of admission submit a nonrefundable enrollment deposit of $600 or more. The deposit is deducted from the first tuition bill after the start of classes.

Admission decision times for the School of Nursing vary by program.

Merit Awards

Merit-based scholarships are invested without regard for a student's/family's financial circumstances, in students who demonstrate outstanding academic achievement and potential. Applicants to the University of Rochester are considered for merit scholarships when they apply for admission to the College (School of Arts and Sciences, Edmund A. Hajim School of Engineering and Applied Sciences). Some scholarships require applicants to submit additional documents. All applicants desiring merit-based awards should

schedule an admission interview.

The following is a list of all the merit awards offered at the University of Rochester: Ahora Scholarship, Bausch & Lomb Honorary Science Award, College Bound, Dean's Scholarship, FIRST Robotics Scholarship, Frederick Douglass and Susan B. Anthony Humanities Award, Genesee Scholarship, George Eastman Young Leaders Award, Harper Scholarship (Martha Matilda Harper), Hillside-Rochester Scholarship, IB Scholarship, Jackie Robinson Foundation Scholarship, Lorenzo de Zavala Scholarship, Meliora Alumni Scholarship, National Achievement Scholarship, National Hispanic Scholarship, National Merit Scholarship, Navy ROTC Scholarship, Renaissance Scholarship, Rochester International Scholarship, Rochester Pledge for Veterans, Rochester Promise Scholarship, Rochester Rotary Oratorical Scholarship, Rochester Ventures Scholarship, Rush Rhees Scholarship, STEP, 7th Generation Scholarship, Urban League Scholarship, Washington Metro Scholarship, The Wilder Trustee Scholarship, Wilson IB Scholarship, Xerox Award for Innovation & Technology, Youth Orchestra Scholarship.

For more detailed information about merit awards at Rochester, please visit www.enrollment.rochester.edu/admissions/money/scholarships.shtm.

ENGINEERING AND APPLIED SCIENCES

Prospective students interested in exploring any of the degree programs in engineering should indicate this interest on their applications. Because of the structured programs that are typical in engineering, it is essential for prospective majors to consult with faculty in choosing courses and sequences. These students are assigned faculty advisors from the Edmund A. Hajim School of Engineering and Applied Sciences at the beginning of their first year.

APPLYING FOR ADMISSION TO A DEGREE PROGRAM IN MUSIC

There are two kinds of bachelor's degree programs in music at the University and, hence, two different application procedures. The College offers, in cooperation with the Eastman School of Music, the Bachelor of Arts (B.A.) degree with a major in music (see page 98). This liberal arts program, based on the River Campus, includes a combination of academic study, private instruction, and ensemble experience. Although the major is a demanding one (students usually take between one-third and one-half of their courses in music), many music majors also explore beyond the introductory level in one or more non music disciplines, sometimes as a double major.

Private instruction on instruments and voice is available to all College students who have sufficient musical preparation to earn collegiate credit for lessons. The required auditions for lessons are arranged through the Department of Music in the College, 207 Todd Union, (585) 275-2828.

The University's Eastman School of Music offers the Bachelor of Music (B.M.) degree in applied music, jazz studies and contemporary media, music composition, music theory, music education, and musical arts. Students in these degree programs pursue intensive studies in music performance and academic music subjects comprising approximately three-fourths of the program, the remainder devoted to study in the humanities as well as elective courses. Admission is by audition and is highly selective. The Eastman School is located in downtown Rochester and Eastman students are housed in the Student Living Center across the street from the School. Information on how to apply for a Bachelor of Music degree at the Eastman School of Music is available on the Web site: www.esm.rochester.edu/apply/. The application deadline for the Eastman School of Music is December 1.

Undergraduate Dual Degree Study

A dual degree program, offering study in the B.A. or B.S. degree from the College (School of Arts and Sciences, Hajim School of Engineering and Applied Sciences) in addition to the B.M. degree from the Eastman School of Music, is available to qualified applicants. The fact that Eastman is a professional school within the University of Rochester makes such combined degree programs possible. Interested students must complete two separate application processes. Admission to the College and Eastman may be based on different criteria and require different application deadlines. Financial aid at the two schools is based on different criteria and policies. This autonomy of admission processes gives each school the latitude to enroll its ideal students.

Once applicants are successfully admitted to Eastman and to the College, they are considered dual degree students of the University. Advisors on each campus are assigned to these students to coordinate the two degree programs. While completing two degrees at the same time can be extremely challenging, about 10–15 students each year choose to pursue this option. For more information, see www.esm.rochester.edu/degrees/dd_ugrad.php.

SCHOOL OF NURSING—ADMISSION

All students admitted to the School of Nursing must hold current licensure as a registered nurse or a prior baccalaureate degree in a non-nursing field. The curriculum is responsive to adult learners, and this is the focus of the baccalaureate program. The School of Nursing has 3+1 agreements with area community colleges for students who need a basic program to become licensed as a registered nurse; the baccalaureate coursework is then completed at the University of Rochester.

Accelerated Programs for Non-Nurses: the one-year Accelerated Baccalaureate Program for Non-Nurses (ABPNN) and three-year Accelerated Master's Program for Non-Nurses (AMPNN) require a prior B.A. or B.S. in a non-nursing field, transcripts, a 3.0 GPA preferred, two letters of reference, a professional statement, and an interview. Anatomy and physiology, microbiology, developmental psychology, nutrition, and statistics (minimum grade of C for all) are prerequisite to the program. At the completion of the one-year generalist curriculum, the Bachelor of Science degree is awarded and students are eligible for professional registered licensing examinations. The Accelerated Master's Program provides education for generalist and specialist (advanced practice) nursing roles and awards the B.S. and M.S. degrees. Students are eligible for professional registered licensing examinations and nurse practitioner licensure. Students are accepted to a nurse practitioner specialty upon admission to the AMPNN program.

For the R.N. to B.S. program (baccalaureate completion program for registered nurses from an associate's or diploma program), a 3.0 GPA is preferred. Nursing license/registration is required. Transcripts, two letters of reference, and a professional statement/short essay are also required.

The R.N. to B.S. to M.S. program is an accelerated program for select registered nurses with defined career goals who desire a master's degree. Applicants have the same admission requirements as master's applicants, with the *exception* of a B.S. in nursing: R.N. licensure/registration, two favorable references, a professional statement, and a statistics course (grade C or above). Applicants must declare a specialty area. An interview may be required.

The B.S. degree is 128 credits. All arts and sciences courses may be transferred in, or challenge examinations are possible. Upon matriculation, 32 nursing credits are awarded automatically for completion of an accredited diploma or associate degree nursing program. A minimum of 32 credits (49 credits for accelerated programs for non-nurses) must be completed through the University of Rochester School of Nursing.

Applicants should contact the Office of Student Affairs at (585) 275-2375 or visit the Web site at www.son.rochester.edu for program deadlines and further information.

ROCHESTER EARLY MEDICAL SCHOLARS PROGRAM ("REMS")

REMS is an eight-year B.A./B.S.-M.D. program for exceptionally talented undergraduates. Students enrolled in this program enter the University of Rochester with an assurance of admission to the University's School of Medicine and Dentistry when they successfully complete their undergraduate degree programs, including GPA and premedical requirements. REMS enrollees work closely with faculty mentors and participate in special seminars and events. Successful REMS candidates possess a demonstrated interest in medicine and have a superior secondary school record, standardized test scores, and recommendations. In addition, REMS applicants must complete the regular undergraduate admission application (or the Common Application and its supplement) and the special REMS Supplementary Application by December 1. Information about the REMS program may be obtained by contacting the REMS Program Coordinator in the Office of Admissions.

GRADUATE ENGINEERING AT ROCHESTER (GEAR)

Students can accelerate and complete their master's degree in engineering and applied sciences in a 3-2 B.S./M.S. program. The GEAR program provides selected students with an assurance of admission into one of seven engineering master's programs at the University of Rochester's Edmund A. Hajim School of Engineering and Applied Sciences: biomedical engineering, chemical engineering, computer science, electrical and computer engineering, materials science, mechanical engineering, or optics. GEAR students receive a 50 percent tuition award in their fifth year of study in the form of a teaching assistantship. To remain eligible, GEAR students are required to maintain a 3.3 GPA through the first seven semesters (3.5 for optics). Applicants for this program will have demonstrated strong aptitude for engineering throughout their high school academic and co-curricular activities.

GUARANTEED ROCHESTER ACCELERATED DEGREE IN EDUCATION (GRADE)

A five-year B.A./B.S.+M.S. in education program for students admitted to the University of Rochester who are interested in becoming educators. GRADE students enter the University with an assurance of admission to the Margaret Warner Graduate School of Education and Human Development with the Steven Harrison quarter-tuition scholarship for all five years. The program is designed to offer students a quality liberal arts education while also preparing them to become educators.

INTERNATIONAL STUDENTS

The University of Rochester values the diversity of a multicultural campus and encourages international students to apply. The University is able to offer merit-based scholarships annually to highly qualified applicants. International applicants are required to submit the same application materials and take the same entrance tests as U.S. citizens, but will also need to provide proof of financial support.

Because SAT and ACT exams are administered less frequently abroad, and scores take longer to be reported, students are advised to contact the American College Testing Program or the College Entrance Examination Board as soon as they decide

to apply to the University. The SAT or ACT should be taken no later than December for fall admission consideration. Because it is often challenging to interpret and evaluate secondary school transcripts from abroad, translations and explanations of grading systems should be submitted. The Ordinary and Advanced level examinations administered in many countries are strongly
recommended when available; the results will be considered both for admission and for placement. All correspondence and applications should be sent by air mail or fax at (585) 461-4595.

Application forms for the SAT may be obtained from secondary schools or the College Entrance Examination Board, P.O. Box 592, Princeton,
New Jersey 08540. Application forms for the ACT can be obtained through secondary schools or by writing to the American College Testing
Program, P.O. Box 168, Iowa City, Iowa 52240.

Applicants whose native language is not English are strongly urged to submit scores from the Test of English as a Foreign Language (TOEFL). Students are expected to have a firm command of the English language before they apply; no provisional admission is offered whereby a student may come to the University and spend a semester or a year learning English.

For questions about undergraduate international admission to Rochester, please contact the Office of Admissions at admit@admissions.rochester.edu.

All R.N. applicants intending to earn their baccalaureate degree from the School of Nursing should contact the Commission on Graduates of Foreign Nursing Schools (CGFNS) for information on obtaining a U.S. registered nurse license (www.cgfns.org).

COLLEGE CREDIT FOR PRIOR COURSEWORK

The University prefers that its entering freshmen take all their courses from Rochester faculty. With the exception of Advanced Placement and International Baccalaureate work, the University normally does not grant college credit for secondary school coursework nor for courses taught in a secondary school by its own faculty for college credit.

Credit may be granted for prior coursework completed with grades of C or better at an accredited college or university. Upon receipt of an official transcript and course descriptions from the college where the student was enrolled, the coursework will be evaluated to determine if it is equivalent to coursework offered through the College at the University of Rochester. Students wishing to receive credit for such college work, or who are now considering taking college courses elsewhere, should ask the College Center for Academic Support, (585) 275-2354, for advice about credit transfer and/or selection of courses.

For students in the School of Nursing, course transfer questions should be directed to the Office of Student Affairs, (585) 275-2375.

ADVANCED PLACEMENT AND INTERNATIONAL BACCALAUREATE CREDIT

Entering students may receive course credit and/or higher-level course placement at Ro-ch-ester through the CEEB Advanced Placement Program. Advanced Placement score reports must be forwarded to the College from the CEEB. Rochester also awards credit for satisfactory scores on the International Baccalaureate (IB) higher level examinations. As soon as these reports are received and reviewed, enrolled students are notified about placement or course credit. This information is used in course selection during Freshman Orientation. Specific questions may be addressed to the College Center for Academic Support, 312
Lattimore Hall, P.O. Box 270402, Rochester, NY 14627. Phone: (585) 275-2354.

TRANSFER ADMISSION

The University of Rochester encourages students who have successfully begun their academic careers at other colleges or universities to continue their educations here on either a full-time or part-time basis. Ordinarily, students who have previously enrolled for at least one semester of full-time study or who have completed a minimum of 8 credit hours at another college after graduation from high school are eligible to apply for transfer admission. Students undertaking college-level coursework as part of their high school programs, or in order to satisfy high school diploma requirements, are eligible to enter as freshmen, although they are welcome to request academic credit for their college work.

Application Procedure

Transfer students may apply for admission to either the fall or spring semester. The recommended deadline for fall consideration is June 1, and for spring, November 1. It is to the student's advantage to complete an application well in advance of the semester for which he or she is applying. This is especially true if the student is requesting financial aid and/or on-campus housing.

The School of Nursing does not accept undergraduate transfer students. Students must have a prior associate's degree in nursing OR a prior non-nursing baccalaureate.

Application Materials

In addition to either the transfer Common Application or Universal College Application form, applicants are required to submit the

transfer supplement, all official college transcripts, and at least one letter of recommendation, preferably from a professor. Applicants who have not completed a year of college are also required to submit high school materials. These include secondary school report, final high school transcript, recommendation from guidance counselor, and official SAT Reasoning or ACT score report(s).

International student applicants who have studied at least a year within the United States are to follow the same application requirements as other applicants. If student applicants have studied outside of the United States, they are required to submit all documents listed above (officially translated, if the originals are not in English) and some additional requirements. Those additional requirements are World Education Services (WES) course-by-course credit evaluation, college course descriptions, and English proficiency scores from Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS). All applicants who are not U.S. permanent residents must also submit an International Financial Support Form to be considered for admission.

Academic Review
Emphasis is placed on the most recent coursework completed at the college level; it is reviewed to determine if students are academically *prepared to pursue a degree at the University*. Applications from candidates who could enter with more than four semesters of transfer credit are generally reviewed by the department in which a major is planned. A maximum of 64 credit hours is transferable to the University of Rochester degree. After reviewing an application, the Committee on Admissions notifies the candidate of its decision soon after the application is completed.

Transfer Credit
Courses taken at another college are evaluated individually for transfer credit and placement. Courses which are judged comparable in level and content to coursework offered at Rochester, and completed with grades of C or better, will transfer for curriculum requirements or for elective credit. When a transfer student applies for a major, the department will designate which transferable courses may be applied toward its requirements.

Residency Requirement
The College requires that students complete a minimum of four semesters of full-time study in residence or, for part-time students, the equivalent number of credit hours to be eligible for the bachelor's degree. Coursework taken at the University prior to admission as a matriculated student does not count toward the residency requirement.

Transfer students are expected to fulfill all requirements set by the College. The School of Nursing programs for R.N.s require a minimum of 32 nursing credits taken at the University of Rochester. The School of Nursing Accelerated Programs for Non-Nurses require a minimum of 49 nursing credits.

Housing
Transfer applicants customarily receive a housing assignment from the Office of Residential Life if their deposit and the University housing contract are received by the specified date each year. Students in need of housing whose application process is completed after all available space has been allocated will be offered assistance in securing alternative housing.

Campus Visits
Students who are considering transfer are urged to visit the campus to become familiar with the University community and to obtain answers to their questions about Rochester. Requests for application materials and campus visits should be directed to the Office of Transfer Admissions, University of Rochester, P.O. Box 270251, Rochester, NY 14627-0251, telephone (585) 275-3221 or (888) 822-2256. Students who bring copies of their transcripts may obtain an advisory opinion of their probable transfer credits and class standing.

Financial Aid
Transfer students in need of financial assistance should file the College Scholarship Service's (CSS) PROFILE Application and the Free
Application for Federal Student Aid (FAFSA). It is recommended that students requesting financial assistance complete the application early. For additional information see the section on financial aid on page 189.

Transfer applicants should note the University does review all transfer applicants for merit-based scholarships. These scholarships do not take into consideration an applicant's financial need. They are awarded based upon a holistic review of an applicant's accomplishments and potential contribution. Scholarship awards generally range from $5,000 to $15,000 per year. The following is a list of some of the merit awards for transfer students: Transfer Dean's, Transfer Rush Rhees, Wilder Trustee Scholarship, Meliora Alumni, Phi Theta Kappa, Rochester Promise, Rochester Pledge, and Hillside-Rochester Work Scholarship.

For more information about these grants and merit-based awards, applicants should contact the Office of Transfer Admissions at (585) 275-3221.

READMISSION

Students who withdraw from the College or are separated for any reason and who wish to re-enter should apply through the College Center for Academic Support. Applications for readmission are reviewed by the dean and other representatives of the College. Students who appear ready to resume their programs are generally approved for readmission, subject to space limitations in departments and residence halls. Applications for readmission should be filed one to two months before the beginning of the term in which the student plans to re-enter. Readmission to the School of Nursing is handled through the Office of Student Affairs, (585) 275-2375.

PART-TIME STUDENTS AND SPECIAL STUDENTS

Part-time nonmatriculated (non-degree) students have an opportunity to try out various programs of study or just enjoy a class for personal enrichment. However, subsequent matriculation as a regular student, if desired, requires application for transfer admission. For details on registering as a nonmatriculated student, visit www.rochester.edu/osp. Matriculated students who wish to change their status from full-time to part-time, or vice versa, need to inform their dean prior to the first day of classes. Tuition will be adjusted for students who change their time status after classes begin.

For more information about part-time enrollment, please visit the Office of Summer and Part-time Studies, 312 Lattimore Hall, www.rochester.edu/osp, or call (585) 275-2345.

Special guidance in planning a program of study in engineering is available from the
Hajim School of Engineering and Applied
Sciences in Lattimore Hall and in nursing from the School of Nursing in Helen Wood Hall. Part-time students are encouraged to write or call for appointments.

The category *special student* includes those full-time students who want to pursue course-work not leading to a degree, those who wish to complete professional school prerequisites, and “visiting” students currently enrolled in another college who wish to attend the University for only a term or a year. Prepro-fes-sion-al advising is available to special students planning to complete requirements at the University for admission to medical or dental school, law school, or other graduate and health professions programs (refer to Career and Counseling Services). Prospective special students are welcome to direct their inquiries to the Office of Transfer Admissions at (585) 275-3221.

Financing an Education

Expenses to be anticipated in determining the cost of an education at Rochester can best be understood as a combination of *fixed* and *variable* expenses. Fixed costs are those payable directly to the University for tuition, fees, and room and board for those living on campus during the 2009–2010 academic year is $52,690. Commuting students who live with their parents in the greater Rochester area may estimate an annual budget of $45,190

Variable expenses are those which an individual student incurs over and above these fixed costs. The largest components of variable expense are likely to be books and transportation. Amounts spent for clothing, recreation, and personal items will differ widely according to the financial circumstances and personal spending patterns of individuals.

On the basis of past experience and for purposes of assessing the need for financial aid, the Financial Aid Office can estimate the average cost to an undergraduate for one year. Generally referred to as the *estimated cost of attendance*, this figure for students living on campus during the 2009–2010 academic year is $52,690. Commuting students who live with their parents in the greater Rochester area may estimate an annual budget of $45,190.

Fixed Costs

Tuition for full-time undergraduates in the College is $37,870 for the 2009–2010 academic year. (Please note that tuition and fees for the Eastman School of Music and the School of Nursing will vary.) A room in a campus residence, double occupancy, is $6,750 per year. The most comprehensive board plan is $4,640 per year. Freshmen incur a one-time charge of $225 for meals and accommodations during orientation.

A mandatory health fee of $576 per year is charged to all full-time students.

All students pay an activity fee, which is established annually by the student government. The fee is $244 for the 2009–2010 academic year. In addition, all resident students pay a social fee of $10 for the academic year.

All students accepted into the Edmund A. Hajim School of Engineering and Applied Sciences become responsible for two years of equipment fees. These fees are normally assessed in the junior and senior years at a rate of $365 each semester.

In addition to fixed costs, undergraduates should expect to pay an average of $1,250 for books, $1,050 for personal expenses.

Payment Options

Undergraduate students are billed on the basis of charges for each semester. The University offers three options for payment of tuition and fees. (1) A Monthly Payment Option consists of four monthly payments for each semester. An administrative fee is charged when this plan is chosen. (2) A Semester Payment Option consists of one payment for each semester. (3) An International Payment Option for students with an international billing address consists of one payment for each semester. Students are billed two months in advance of the due date and payment must be in US dollars and drawn on a U.S. bank.

The student billing statement is viewed online from the student portal: http://my.rochester.edu under **UR ePAY.** Students and Authorized Payers receive an e-mail each month when the new billing statement is available. Students can set up individuals (parents, guardians, spouses, or third parties) as Authorized Payers to view and pay their bills online. Students are encouraged to pay

their bill online using **UR ePAY** via electronic check payment. Students are responsible for viewing their billing statement online each month and will not receive a statement in the mail.For more information regarding **UR ePAY**, visit the bursar's Web site: www.rochester.edu/adminfinance/bursar and click on **UR ePAY**.

All students are required to sign a payment agreement. All other charges will be due in full by the date indicated on the statement. If full payment is not received by the due date, the University will assess a late payment fee of 1 percent of the amount past due. Students who have not returned a Payment Agreement will be unable to register for class until the Agreement is submitted and will be expected to pay the full amount due before the next due date. Arrangements to have funds available for payment should therefore be made well in advance of each due date. Postdated checks submitted cannot be held for deposit. Students who are delinquent in their payments are not allowed to register for the next semester, receive transcripts, participate in the housing lottery, or receive their diplomas. Students with delinquent balances at the end of a semester may be withdrawn from the University. All prior academic year balances must be paid in full before the start of the next academic year. Students whose past due balance is $5,000 or greater, or who submit a check that is returned by the bank, are subject to cancellation of registration for the current semester and withdrawal from the University unless acceptable arrangements are promptly made.

Financial aid awards to be received by students will be used as anticipated credits against charges assessed, following receipt of all proper documentation. Questions concerning financial aid awards, what documentation must be submitted to the University, etc., should be directed to the Financial Aid Office.

A Prepaid Tuition Plan is available that enables incoming first-year students to prepay four years of tuition at the rate in effect during the year of initial enrollment. Enrolled students may join the plan at the beginning of the fall semester, as long as four or more semesters remain in their undergraduate program. The tuition rate charged will be the rate in effect at the time they join the plan. More information on this plan and the other payment options is available from the bursar's office via their Web site: www.rochester.edu/adminfinance/bursar/.

Detailed information about financial aid follows.

FINANCIAL AID

The Financial Aid Office is here to help students and their families afford the investment of a Rochester education through a combination of different aid programs.

Applying for Financial Aid

Incoming students must complete the CSS PROFILE online at www.collegeboard.com. The University of Rochester school code is 2928, and our priority deadline is February 1 for regular decision applicants (November 15 for early decision applicants).

In addition, students must submit the Free Application for Federal Student Aid (FAFSA) online at www.fafsa.ed.gov by February 1. The FAFSA is officially available after January 1. The University of Rochester school code is 002894.

All applicants who are not U.S. citizens or permanent residents should file the International Student Financial Aid Application, available through the Office of Admissions.

Renewing Financial Aid

Students receiving need-based financial aid must file the FAFSA each year. Additional application materials are also required, and students are notified at the beginning of the spring semester each year so that they may complete the application process by April 15. Returning students who do not submit their financial aid application with all supporting documentationby April 15 should be aware that they are not guaranteed full consideration for need-based assistance and may have their aid reduced due to limited funding.

Estimated Family Contribution

The family contribution is based on an analysis of the financial aid application materials provided by each student that takes into consideration income, assets, family size, number of siblings in college, and other variables. As these variables often change from year to year, students must submit application materials each spring to assess the family contribution for the coming academic year.

General Awarding Guidelines

Students receiving merit- and/or need-based University scholarships/grants should be aware that certain restrictions apply:

- Entering freshmen are limited to eight semesters of scholarship/grant assistance, transfer students are eligible for assistance until the graduation date determined at the time of admission
- University scholarships/grants require full-time enrollment (at least 12 credits/semester)
- Students must meet Satisfactory Academic Progress requirements
- University scholarships/grants are not available for summer coursework

TYPES OF FINANCIAL ASSISTANCE

Merit-Based Scholarships
Merit-based scholarship recipients demonstrate outstanding academic achievement, talent, leadership, and potential. The Admissions Office carefully considers a student's application for admission when making these decisions. Merit-based scholarships will be included in the calculation of need-based aid. The Admissions section provides additional information on these awards.

Need-Based Financial Aid Programs
Demonstrated need is calculated by subtracting a family's estimated contribution from our cost of attendance. The Financial Aid Office uses demonstrated need to determine eligibility for scholarships, grants, loans, and work opportunities. While every student's financial aid package is different, the following are some of the most common financial aid programs. Amounts will vary based on each individual student's demonstrated need. Aid cannot disburse to the student account until 10 days prior to the beginning of classes each term.

GRANTS

Federal Pell Grant. A federal program designed to assist students whose families demonstrate the highest need.

Federal Supplemental Educational Opportunity Grant (SEOG). A joint program between the federal government and the University of Rochester to provide additional funding to students whose families demonstrate the highest need.

Federal Academic Competitiveness Grant (ACG). A federal program providing assistance to first- and second-year students whose families demonstrate the highest need. Eligible students must be either a first- or second-year student receiving Pell.

National Science and Mathematics Access to Retain Talent (SMART) Grant. Students must be either a third- or fourth-year student receiving Pell enrolled in an eligible major.

Tuition Assistance Program (TAP). A NYS program based upon a family's NYS taxable income. This requires a separate application available once the FAFSA has been filed. Our school code is 1015. If the application is not completed, any estimated awards will be lost.

New York State Bundy Grant. A NYS program that allows the University to provide grant funding to NYS residents whose families demonstrate the highest need.

Rochester National Grant (RN). The University of Rochester commits significant resources to need-based grant funding.

Endowed. The RN grant is funded through hundreds of need-based endowed scholarships.

State Grants. Certain states outside New York will allow their grant programs to be used at schools in New York. Contact your state agency for more information.

LOANS
Federal Perkins Loan. The Perkins Loan Program is a joint program between the federal government and the University designed to provide low interest loans to assist students whose families demonstrate the highest need.

Subsidized Federal Direct Loan. The Direct Loan Program is a federal program designed to provide students demonstrating financial need with a low-interest loan to help cover the cost of education. Maximum annual eligibility is determined be a student's class year standing.

WORK OPPORTUNITIES
Federal Work-Study Program (FWS). The FWS Program is a joint program between the federal government and the University designed to provide opportunities for students to work during the school year to earn money to help cover their educational expenses. Opportunities are available across campus as well as the surrounding community. Students are paid an hourly wage for work performed. There is a special emphasis on community service opportunities. See Career Center (page 179) for more information on these offerings.

Institutional Employment. Campus employment is not limited to the FWS Program. Many students without FWS eligibility work in dozens of different departments on campus.

OTHER FINANCIAL RESOURCES
In addition to the merit- and need-based programs offered through the University, there are many other financial resources students and families may wish to pursue. For example, the strength of the candidates who apply to the University often makes our applicants excellent candidates for outside scholarships. Family employers, local foundations, clubs, and community agencies are excellent sources for scholarship opportunities. In addition, students should take advantage of resources such as their guidance office, local library, and the Internet. The Financial Aid Office's Web site includes links to multiple resources: http://enrollment.rochester.edu/financial/.

Many families are also interested in financing a portion of the cost of education through long-term financing options. Additional

information regarding these options is available on the Financial Aid Office's Web site.

Common programs include the following:

Unsubsidized Federal Direct Loan. The Direct Loan Program also offers an unsubsidized version for students whose financial need is met through other resources. The interest on this low interest educational loan accrues while the student is in school.

Federal Direct Parent PLUS Loan. The PLUS Program allows parents to borrow up to the cost of education minus any other financial aid offered. This loan can be deferred while the student or the borrower is enrolled at least half time in a degree-seeking program.

SCHOOL OF NURSING

School of Nursing Grants. For any nursing grants, please contact the School of Nursing directly at (585) 275-2375.

Federal Nursing Loans. Loans from this federal program are authorized by the Financial Aid Office. Repayment begins nine months after completion of studies. Similar to the Federal Perkins Loans, specified deferment provisions are available. Eligibility is restricted to U.S. citizens or permanent residents and on availability of funding.

For financial aid assistance for the School of Nursing, please see www.son.rochester.edu/son/prospective-students/finances/financial-aid.

Part-Time Employment

Students may receive Federal Work-Study as part of their total aid award. Earnings through Federal Work-Study are paid directly to the student at a rate dependent on the specific job held. Ordinarily 10 to 15 hours per week is a suggested work load for students who seek to earn the amount awarded. Opportunities are also available to students without Federal Work-Study funding who wish to work on campus. The Career Center is the centralized site for on-campus information regarding postings. See the section on Career and Counseling Services for more information on these offerings.

The College:
Fixed Cost Summary 2009–2010

Tuition (for full-time students)	
The College	$37,870
Room	6,750
Board	4,640*
Fees (approximately)	880
Total Annual Fixed Cost	$50,140

*Other plans available.
Engineering juniors and seniors pay an engineering equipment fee of $730 per year.
NOTE: For adjustment of charges in case of withdrawal, see page 175, Adjustment Charges, Withdrawal, and Inactive Status.
NOTE: *Noncredit course fees.* All persons attending noncredit courses must pay fees as announced for these courses.

General Regulations

Students are expected to abide by the rules of the University and its faculties and to conduct themselves in accordance with accepted standards of good citizenship, honesty, and propriety, and with proper regard for the rights of others. When the University delegates judicial and disciplinary responsibilities to faculty, staff, or student groups, students must abide by their decisions. Of course, students must obey federal, state, and local laws as would any other citizens.

Disciplinary sanctions up to and including expulsion may be imposed upon members of the University community for certain infractions, including by way of example the following:
1. Academic cheating or plagiarism, furnishing false information to the University or to members of the University community, forgery, alteration or misuse of University documents, records, or identification cards, or violation of fire safety regulations; and
2. Acts which are illegal under the law, including, but not limited to, theft; disorderly conduct; computer crime; manufacture, sale, possession, or distribution of illegal drugs, including alcohol; rape; possession or use of firearms or explosive materials; assault or battery; vandalism; reckless endangerment of other persons; unauthorized possession of master keys; and failure to comply with reasonable requests of University officials in performance of their duties.

The above is not an exhaustive list or description of the precise conduct that may lead to discipline, but is intended to be illustrative. Specific policies, rules, and regulations concerning academic and non-academic conduct, and the procedures for addressing violations are available from the deans' offices of the College, the Eastman School of Music, and the School of Nursing.

UNIVERSITY RECORDS

The University policy on student records is available to students and their parents through the Office of the University Registrar.

Reports to Parents

Federal law permits the University to disclose education records to parents of dependent students. It is the policy of the University to consider all matriculated undergraduate students dependent until the age of 21 unless they formally declare their independence, either at the time of enrollment or subsequently through application to the dean's office of their college.

The University and Eastman School registrars will release grade information to parents when permitted by law, unless the student objects and/or disclosure would not be in the student's best interest in the judgment of the College. The College and the Eastman School of Music will generally honor written (not e-mail), signed requests by students to release their grades to parents or other persons specified. Signed, written (not e-mail) grade requests by parents of undergraduates will also generally be honored; however, the College may deny a request if the student objects or if the dean decides that disclosure is not in the student's best interest or if the student cannot be claimed as a dependent.

Unless otherwise directed, reports concerning dependent students will be sent to the par-ent(s) or guardian(s) at the address designated on the registration materials at the time of enrollment.

If divorced or separated parents wish to receive individual mailings, the student should so advise the registrar's office (College and School of Nursing students, Office of the University Registrar; Eastman School students, the Eastman School Registrar).

Notification of a change of address, or of a change in the designation of the parent who is to receive University mailings, should be made by the student to the appropriate registrar's office.

DESCRIPTION OF POLICIES AND RULES

A list of publications that fully describe all policies and rules pertaining to University programs is contained in the course schedule published before the start of each term and on the University's Web site. These publications include, for example, an undergraduate course description handbook, the *Official Bulletin: Graduate Studies,* the *UR Here* handbook and the College Dean of Students'

pamphlet entitled *Student Discipline: Conduct Standards, Policies, and Procedures,*for undergraduates. Policies and rules for nursing students are listed in the student handbook. Policies and rules for Eastman students are available on the Eastman's Office of the Registrar's Web site under the heading of Academic Policy, Curriculum & Integrity.

STUDENT COMPLAINT PROCEDURE

Both informal and formal procedures exist to resolve student complaints involving harassment, discrimination, and other issues. Information about such procedures can be obtained from the deans' offices of the College, the Eastman School of Music, and the School of Nursing; from the University Intercessors; or by contacting the University's Equal Opportunity Coordinator at 24 Wallis Hall, phone 275-9125.

INVENTORY OF REGISTERED PROGRAMS

The New York State Education Department has authorized the University of Rochester to offer the undergraduate-level programs which appear in the following inventory. A listing of graduate programs offered at the University may be found in the *Official Bulletin: Graduate Studies*. Programs offered at the Eastman School of Music may be found in the *Official Bulletin: Eastman School of Music*.

Program Code	Hegis Code	Program Name	Degree	Cert
The College				
27645	2211	African & African-American Studies	BA	
25080	1199	American Sign Language	BA	
10797	2202	Anthropology	BA	
83250	1703	Applied Mathematics	BS	
		Art and Art History		
10677	1003	Art History	BA	
10676	1002	Studio Arts	BA	
33040	0499	Bioethics	BA	
10608	0401	Biology	BA	
81462	0401	Biological Sciences	BS	
21510	0401/0425	Biological Sciences—Neuroscience	BS/MS	
20182	2002	Brain and Cognitive Sciences	BA	
29039	2002	Brain and Cognitive Sciences	BS	
10767	1905	Chemistry	BA	
10766	1905	Chemistry	BS	
19800	0701	Computer Science	BA	
19799	0701	Computer Science	BS	
		Earth and Environmental Sciences		
91548	0420	Environmental Science	BS	
91549	0420	Environmental Studies	BA	
10776	1914	Geological Sciences	BA	
10779	1914	Geological Sciences	BS	
10669	0912	Geomechanics	BS	
10798	2204	Economics	BA	
32273	2204	Economics and Business Strategies	BA	
10729	1501	English	BA	
33041	1299	Epidemiology	BA	
83154	1010	Film and Media Studies	BA	
31197	2204	Financial Economics	BA	
85228	2299	Health & Society	BA	
33039	2299	Health Behavior and Society	BA	
33042	1214	Health Policy	BA	
10802	2205	History	BA	
10812	4901	Interdepartmental Degree Program	BA	
32178	2210	International Relations	BA	
10739	1505	Linguistics	BA	
10744	1701	Mathematics	BA	
27779	1701	Mathematics	BS	
77418	1799	Mathematics & Statistics	BA	
		Modern Languages and Cultures		
78107	1503	Comparative Literature	BA	
10702	1102	French	BA	
10706	1103	German	BA	
87111	1108	Japanese	BA	
10715	1106	Russian	BA	
10714	1105	Spanish	BA	
10691	1005	Music	BA	
10740	1509	Philosophy	BA	
10756	1902	Physics	BA	
10758	1902	Physics	BS	
10775	1901	Physics & Astronomy	BA	

10774	1901	Physics & Astronomy	BS
10805	2207	Political Science	BA
09314	2001	Psychology	BA
		Religion and Classics	
10736	1504	Classics	BA
10743	1510	Religion	BA
19679	0307	Russian Studies	BA
10751	1702	Statistics	BA
85431	1702	Statistics/Medical Statistics	BA/MS
83147	4903	Women's Studies	BA
Edmund A. Hajim School of Engineering and Applied Sciences			
20883	0905	Biomedical Engineering	BS, BS/MS
10662	0906	Chemical Engineering	BS, BS/MS
10663	0909	Electrical and Computer Engineering	BS
80164	0909	Electrical and Computer Engineering	BS/MS
10655	0901	Engineering & Applied Science	BS
91240	0901	Engineering Science	BA
10669	0912	Geomechanics	BS
10668	0910	Mechanical Engineering	BS
20445	0910	Mechanical Engineering	BS/MS
10673	0999	Optics	BS, BS/MS
School of Nursing			
26701	1203.00	Accelerated Bachelor's Programs for Non-Nurses	BS
22440	1203.00	R.N. TO B.S. Nursing	BS
26702	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Adult Nurse Practitioner	BS/MS
26703	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Acute Care Nurse Practitioner	BS/MS
26704	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Care of Children & Families Pediatric Nurse Practitioner	BS/MS
26706	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Family Nurse Practitioner	BS/MS
26708	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Psychiatric/Mental Health Nurse Practitioner	BS/MS
31860	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Child & Adolescent Psychiatric Mental Health Nurse Practitioner	BS/MS
31859	1203.00/ 1203.10	Nursing/Accelerated Master's Program for Non-Nurses—Care of Children and Families—Pediatric Nurse Practitioner with Pediatric Behavioral Health	BS/MS
91014	1203.10	Nursing/Acute Care Nurse Practitioner	BS/MS
91018	1203.10	Nursing/Adult Nurse Practitioner	BS/MS
84160	1203.10	Nursing/Care of Children & Families—Pediatric Nurse Practitioner	BS/MS
22502	1203.10	Nursing/Care of Children & Families—Pediatric Nurse Practitioner/Neonatal Nurse Practitioner	BS/MS
20271	1203.10	Nursing/Family Nurse Practitioner	BS/MS
91016	1203.10	Nursing/Psychiatric/Mental Health Nurse Practitioner	BS/MS
31862	1203.10	Nursing/Child & Adolescent Psychiatric Mental Health Nurse Practitioner	BS/MS
31861	1203.10	Nursing/Care of Children and Families—	

		Pediatric Nurse Practitioner with Pediatric Behavioral Health	BS/MS	
32667	1203.10	Nursing/Adult Nurse Practitioner/ Geriatric Nurse Practitioner	BS/MS	
Eastman School of Music				
10684	1004	Applied Music	BM	
10679	1004.10	Composition	BM	
19692	1004	Jazz Studies and Contemporary Media	BM	
13890	0832	Music Education	MB	B
23682	0832	Music Education Birth–12	BM	B
22428	1004	Musical Arts	BM	
10683	1004.10	Theory	BM	

Index

B

C

D

E

F

ABBREVIATIONS

AAS	African & African-American Studies
ACC	Accounting
AH	Art History
ANT	Anthropology
ARA	Arabic
ASL	American Sign Language
AST	Astronomy
BCH	Biochemistry
BCS	Brain and Cognitive Sciences
BIO	Biology
BME	Biomedical Engineering
CAS	Arts & Sciences, the College
CGR	Classic Greek
CHE	Chemical Engineering
CHI	Chinese
CHM	Chemistry
CIS	Computers & Information Systems
CLA	Classical Studies
CLT	Comparative Literature
CSC	Computer Science
CSP	Clinical and Social Sciences in Psychology
CVS	Center for Visual Science
DAN	Dance
EAS	Engineering & Applied Sciences
ECE	Electrical and Computer Engineering
ECO	Economics
ED	Education
EDU	Education
EE	Electrical Engineering
EES	Earth and Environmental Sciences
ENG	English
FIN	Finance
FR	French
FMS	Film and Media Studies
GBA	General Business Administration
GER	German
HEB	Hebrew
HIS	History
HLS	Health and Society
IDE	Interdepartmental Engineering
IPA	Interdepartmental, Arts and Sciences
IR	International Relations
IT	Italian
JPN	Japanese
JST	Judaic Studies
LAT	Latin
LAW	Law
LIN	Linguistics
LTS	Literary Translation Studies

MBI	Microbiology	
ME	Mechanical Engineering	
MKT	Marketing	
MSC	Materials Science	
MTH	Mathematics	
MUR	Music	
NAV	Naval Science	
NSC	Neuroscience	
NUR	Nursing	
OMG	Operations Management	
OPT	Optics	
PEC	W. Allen Wallis Institute of Political	Economy
PHL	Philosophy	
PHY	Physics	
POL	Polish	
PSC	Political Science	
PSY	Psychology	
REL	Religion and Classics	
ROM	Romanian	
RUS	Russian	
RST	Russian Studies	
SA	Studio Arts	
SKT	Sanskrit	
SOC	Sociology	
SP	Spanish	
STT	Statistics	
UJ	Jagiellonian University, Krakow,	Poland
WRT	Writing Program	
WST	Women's Studies	
YDH	Yiddish	

Footnotes

Page 40: *Recommended for seniors only and requires permission of instructor.

Page 42: *Students interested in pursuing graduate work in speech and hearing are strongly encouraged to take Introduction to Sound Systems (LIN 210) even though it cannot be used to fulfill the BCS track requirement.

Page 44: *Students cannot take both BCS 111 and 112.

Page 49: 1. CHM 234 can be replaced by an approved lab-oratory course in another science department.
2. Eight credit hours of CHM 393 (senior research) are re-quired for a B.S. degree. Students must prepare a senior research thesis, and have the thesis read and approved by the research advisor and a second faculty member in chemistry.
3. Four credits of a 400-level chemistry course may be taken anytime during the junior or senior year.
4. Students must select one course from the following: mathematics (MTH 164 or a 200-level mathematics course), computer science (CSC 170, 171), or statistics (STT 201, 211, 212).
5. Careful consultation with faculty is necessary to choose an appropriate program. Students are urged to include advanced work in related sciences consistent with their professional aims, such as more mathematics and physics for graduate work in physical chemistry, biology for graduate work in biochemistry, etc.
6. B.S. chemistry majors who complete CHM 171Q and CHM 172Q must include either CHM 262 or BIO 250
(Biochemistry) or CHM 132 or an approved 200/400-level science course.

Page 50: *Taken with consent of the instructor.
†Offered in alternate years.

Page 51: *Taken with consent of the instructor.

Page 124: *Part-time.

Page 148: 1. This is a non-required first-year ECE elective. Advanced 200-level ECE technical electives, taken during the third or fourth year or ECE 140 taken in the first or second year may be substituted for ECE 101.
2. Acceptable alternative sequences: MTH 141, 142, 143, 165, 164; 171, 172, 173, 174. Students are encouraged to take MTH 165 although MTH 163 is an acceptable alternative.
3. Two physics courses, PHY 121 and 122, are required of all ECE majors. In addition, one other course in natural science from among AST, BIO, CHM, EES, or PHY must be taken. Selected courses from some other disciplines such as neuroscience and brain and cognitive sciences may also satisfy the ECE program's natural science requirement but students should check with the ECE department prior to taking such courses to confirm that the course will indeed satisfy the natural science requirement.
4. In the ECE program a total of five courses in the humanities and social sciences is required. Three of these courses must constitute an approved cluster in humanities or social sciences and must be passed with a 2.0 average or better. See the Cluster Search Engine (www.rochester.edu/College/CCAS/clusters) and descriptions of clusters in this bulletin.

Page 151: *Licensed professional engineer.
†Part-time.

Page 152: 1. The alternative sequence MTH 141, 142, 143 may be taken instead of 161, 162.
2. We strongly recommend ME 104Q.
*Offered both semesters

Page 156: 1. An alternative approved sequence is MTH 171, 172, 173, 174 for those considered eligible by the Department of Mathematics or MTH 141, 142, 143, 163, or 165, 164.
2. OPT 101 is recommended.
3. PHY 238 may be substituted for OPT 242 by students who minor in physics.
4. OPT 241 and 256 fulfill the upper-level writing requirement.

Page 157: * Admission is normally limited to those students enrolled in the five-year optics B.S.-M.S. program.

Page 158: * Licensed professional engineer.
1. An alternative approved sequence is MTH 171, 172 for those considered eligible by the Department of Mathematics. An acceptable alternative sequence to MTH 161.
2. One of these must be ME 241 or ME 242. Four of the remaining five shall be taken from earth and environmental sciences or mechanical engineering. The sixth may be any technical course approved by your faculty advisor.

Page 173: *Noncredit course fees: All persons attending noncredit courses must pay fees as announced for these courses. If they are organized outside the normal academic framework, noncredit courses may not be covered by the usual blanket undergraduate full-time tuition.

Page 175: *The Hajim School of Engineering and Applied Sciences does not give the grades of D+ and D–.

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